MathJax basic tutorial and quick reference

Asked 9 years, 10 months ago Modified 2 months ago Viewed 1.4m times

3724

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(Deutsch: MathJax: LaTeX Basic Tutorial und Referenz)

1. To see how any formula was written in any question or answer, including this one, right-click on the expression and choose "Show Math As > TeX Commands". (When you do this, the '$' will not display. Make sure you add these: see the next point. There are also other ways to view the code for the formula or the whole post.)
2. **For inline formulas, enclose the formula in `$ ... $`. For displayed formulas, use `$$ ... $$`.**
   These render differently. For example, type
   `$\sum_{i=0}^n i^2 = \frac{(n^2+n)(2n+1)}{6}$`
   to show $\sum_{i=0}^{n} i^2 = \frac{(n^2+n)(2n+1)}{6}$ (which is inline mode) or type
   `$$\sum_{i=0}^n i^2 = \frac{(n^2+n)(2n+1)}{6}$$`
   to show
   $$\sum_{i=0}^{n} i^2 = \frac{(n^2+n)(2n+1)}{6}$$
   (which is display mode).
3. For **Greek letters**, use `\alpha`, `\beta`, ..., `\omega`: α, β, ..., ω. For uppercase letters, use `\Gamma`, `\Delta`, ..., `\Omega`: Γ, Δ, ..., Ω. For other Greek capital letters, use Latin A, B, E, and so on. Some Greek letters have variant forms: `\epsilon \varepsilon` ϵ, ε, `\phi \varphi` ϕ, φ, and others.
4. For **superscripts and subscripts**, use `^` and `_`. For example, `x_i^2`: x_i^2, `\log_2 x`: $\log_2 x$.
5. **Groups**. Superscripts, subscripts, and other operations apply only to the next "group". A "group" is either a single symbol, or any formula surrounded by curly braces `{ ... }`. If you do `10^10`, you will get a surprise: 10^10. But `10^{10}` gives what you probably wanted: 10^{10}. Use curly braces to delimit a formula to which a superscript or subscript applies: `x^5^6` is an error; `{x^y}^z` is x^{y}^{z}, and `x^{y^z}` is x^{y^z}. Observe the differences between `x_i^2` x_i^2, `x_{i^2}` x_{i^2} and `{x_i}^2` ${x_i}^2$.
6. **Parentheses** Ordinary symbols `()[]` make parentheses and brackets $(2+3)[4+4]$. Use `\{` and `\}` for curly braces $\{\}$.

   These do *not* scale with the formula in between, so if you write `(\frac{\sqrt x}{y^3})` the parentheses will be too small: $(\frac{\sqrt x}{y^3})$. Using `\left( ... \right)` will make the sizes adjust automatically to the formula they enclose: `\left(\frac{\sqrt x}{y^3}\right)` is $\left(\frac{\sqrt x}{y^3}\right)$.

   `\left` and `\right` apply to all the following sorts of parentheses: `(` and `)` (x), `[` and `]` $[x]$, `\{` and `\}` $\{x\}$, `|` $|x|$, `\vert` $|x|$, `\Vert` $\|x\|$, `\langle` and `\rangle` $\langle x\rangle$, `\lceil` and `\rceil` $\lceil x\rceil$, and `\lfloor` and `\rfloor` $\lfloor x\rfloor$. `\middle` can be used to add additional dividers. There are also invisible parentheses, denoted by `.`: `\left.\frac12\right\rbrace` is $\left.\frac12\right\rbrace$.

7. **Sums and integrals** `\sum` and `\int`; the subscript is the lower limit and the superscript is the upper limit, so for example `\sum_1^n` $\sum_1^n$. Don't forget `{ ... }` if the limits are more than a single symbol. For example, `\sum_{i=0}^\infty i^2` is $\sum_{i=0}^\infty i^2$. Similarly, `\prod` $\prod$, `\int` $\int$, `\bigcup` $\bigcup$, `\bigcap` $\bigcap$, `\iint` $\iint$, `\iiint` $\iiint$, `\idotsint` $\int\cdots\int$.

8. **Fractions** There are three ways to make these. `\frac ab` applies to the next two groups, and produces $\frac{a}{b}$; for more complicated numerators and denominators use `{ ... }`: `\frac{a+1}{b+1}` is $\frac{a+1}{b+1}$. If the numerator and denominator are complicated, you may prefer `\over`, which splits up the group that it is in: `{a+1\over b+1}` is $\frac{a+1}{b+1}$. For continued fractions, use `\cfrac` instead of `\frac`.

9. **Fonts**

- Use `\mathbb` or `\Bbb` for "blackboard bold": $\mathbb{CHNQRZ}$.
- Use `\mathbf` for boldface: $\mathbf{ABCDEFGHIJKLMNOPQRSTUVWXYZ\ abcdefghijklmnopqrstuvwxyz}$.
  - For expression based characters, use `\boldsymbol` instead: $\boldsymbol{\alpha}$
- Use `\mathit` for italics: $\mathit{ABCDEFGHIJKLMNOPQRSTUVWXYZ\ abcdefghijklmnopqrstuvwxyz}$.
- Use `\pmb` for boldfaced italics: $\pmb{ABCDEFGHIJKLMNOPQRSTUVWXYZ\ abcdefghijklmnopqrstuvwxyz}$.
- Use `\mathtt` for "typewriter" font: $\mathtt{ABCDEFGHIJKLMNOPQRSTUVWXYZ\ abcdefghijklmnopqrstuvwxyz}$.
- Use `\mathrm` for roman font: $\mathrm{ABCDEFGHIJKLMNOPQRSTUVWXYZ\ abcdefghijklmnopqrstuvwxyz}$.
- Use `\mathsf` for sans-serif font: $\mathsf{ABCDEFGHIJKLMNOPQRSTUVWXYZ\ abcdefghijklmnopqrstuvwxyz}$.
- Use `\mathcal` for "calligraphic" letters: $\mathcal{ABCDEFGHIJKLMNOPQRSTUVWXYZ}$ (Uppercase only.)
- Use `\mathscr` for script letters: $\mathscr{ABCDEFGHIJKLMNOPQRSTUVWXYZ\ abcdefghijklmnopqrstuvwxyz}$
- Use `\mathfrak` for "Fraktur" (old German style) letters: $\mathfrak{ABCDEFGHIJKLMNOPQRSTUVWXYZ\ abcdefghijklmnopqrstuvwxyz}$.

10. **Radical signs / roots** Use `sqrt`, which adjusts to the size of its argument: `\sqrt{x^3}` $\sqrt{x^3}$; `\sqrt[3]{\frac xy}` $\sqrt[3]{\frac{x}{y}}$. For complicated expressions, consider using `{...}^{1/2}` instead.

11. Some **special functions** such as "lim", "sin", "max", "ln", and so on are normally set in roman font instead of italic font. Use `\lim`, `\sin`, etc. to make these: `\sin x` $\sin x$, not `sin x` $sinx$. Use subscripts to attach a notation to `\lim`: `\lim_{x\to 0}`

$$\lim_{x\to 0}$$

Nonstandard function names can be set with `\operatorname{foo}(x)` $\operatorname{foo}(x)$.

12. There are a very large number of **special symbols and notations**, too many to list here; see the short listing LaTeX and AMS-LaTeX Symbols prepared by Dr. Emre Sermutlu, or the exhaustive listing The Comprehensive LaTeX Symbol List by Scott Pakin. Some of the most common include:

- `\lt \gt \le \leq \leqq \leqslant \ge \geq \geqq \geqslant \neq` $<, >, \le, \leq, \leqq, \leqslant, \ge, \geq, \geqq, \geqslant, \neq$. You can use `\not` to put a slash through almost anything: `\not\lt` $\not<$ but it often looks bad.
- `\times \div \pm \mp` $\times, \div, \pm, \mp$. `\cdot` is a centered dot: $x \cdot y$
- `\cup \cap \setminus \subset \subseteq \subsetneq \supset \in \notin \emptyset \varnothing` $\cup, \cap, \setminus, \subset, \subseteq, \subsetneq, \supset, \in, \notin, \emptyset, \varnothing$
- `{n+1 \choose 2k}` or `\binom{n+1}{2k}` $\binom{n+1}{2k}$
- `\to \gets \rightarrow \leftarrow \Rightarrow \Leftarrow \mapsto \implies \iff` $\to, \gets, \rightarrow, \leftarrow, \Rightarrow, \Leftarrow, \mapsto, \implies, \iff$
- `\land \lor \lnot \forall \exists \top \bot \vdash \vDash` $\land, \lor, \lnot, \forall, \exists, \top, \bot, \vdash, \vDash$
- `\star \circledast \ast \oplus \circ \bullet` $\star, \circledast, \ast, \oplus, \circ, \bullet$
- `\approx \sim \simeq \cong \equiv \prec \lhd \rhd` $\approx, \sim, \simeq, \cong, \equiv, \prec, \lhd, \rhd$
- `\infty \aleph_0` $\infty \aleph_0$ `\nabla \partial` ∇, ∂ `\Im \Re` $\Im, \Re$
- For modular equivalence, use `\pmod` like this: `a\equiv b\pmod n` $a \equiv b \pmod n$. For the binary mod operator, use `\bmod` like this: `a\bmod 17` $a \bmod 17$.
- Use `\dots` for the triple dots in $a_1, a_2, \dots, a_n$ and $a_1 + a_2 + \cdots + a_n$
- Script lowercase l is `\ell` ℓ.

  Detexify lets you draw a symbol on a web page and then lists the TEX symbols that seem to resemble it. These are not guaranteed to work in MathJax, but it's a good place to start. To check that a command is supported, note that MathJax.org maintains a list of currently supported $LaTeX$ commands, and one can also check Dr. Carol JVF Burns's page of TEX Commands Available in MathJax.

13. **Spaces** MathJax usually decides for itself how to space formulas, using a complex set of rules. Putting extra literal spaces into formulas will not change the amount of space MathJax puts in: `a␣b` and `a␣␣␣␣␣b` are both ab. To add more space, use `\,` for a thin space $a\,b$; `\;` for a wider space $a\;b$. `\quad` and `\qquad` are large spaces: $a\quad b$, $a\qquad b$.

    To set plain text, use `\text{…}` : $\{x \in s \mid x \text{ is extra large}\}$. You can nest `$…$` inside of `\text{…}`, for example to access spaces.

14. **Accents and diacritical marks** Use `\hat` for a single symbol $\hat{x}$, `\widehat` for a larger formula $\widehat{xy}$. If you make it too wide, it will look silly. Similarly, there are `\bar` $\bar{x}$ and `\overline` $\overline{xyz}$, and `\vec` $\vec{x}$ and `\overrightarrow` $\overrightarrow{xy}$ and `\overleftrightarrow` $\overleftrightarrow{xy}$. For dots, as in $\frac{d}{dx}x\dot{x} = \dot{x}^2 + x\ddot{x}$, use `\dot` and `\ddot`.

15. Special characters used for MathJax interpreting can be escaped using the `\` character: `\$` $, `\{` {, `\}` }, `\_` _, `\#` #, `\&` &. If you want `\` itself, you should use `\backslash` (symbol) or `\setminus` (binary operation) for $\setminus$, because `\\` is for a new line.

(Tutorial ends here.)

It is important that this note be reasonably short and not suffer from too much bloat. To include more topics, please create short addenda and post them as answers instead of inserting them into this post.

Contents

Alphabetical list of links to MathJax topics, by title:

- Absolute values and norms • Additional symbolic decorations • Aligning Equations
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- Arrays • Big braces • Colors
- Commutative diagrams • Continued fractions • Crossing things out
- Definitions by cases (piecewise functions) • Degree symbol • Display style
- Equation numbering • Fussy spacing issues • Highlighting expressions
- Left and right arrows • Limits • Linear programming
- Long division • Math Programming • Matrices
- Markov Chains • Mixing code and MathJax formatting on lines • The \newcommand function
- Numbering Equations • Overlaying Symbols • Packs of cards
- Symbols • System of equations • Tables
- Tags and references • Tensor indices • Units
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MJD

33 Some capital Greek letters are the same as the Roman equivalents, so they are not separated in $\LaTeX$. For a capital beta, one must use something like `\mathrm{B}` : B – robjohn Mod 2012-08-28 02:06:45Z

10 Two related questions: How do I insert a table when asking a question? and How to show the integral symbol on this site? – Martin Sleziak 2012-08-28 13:26:02Z

34 A quick addition to point 11: If you want to use a sin-like symbol that is not already defined, the command is `\operatorname` : e.g., `\operatorname{Spec} A` gives $\operatorname{Spec} A$. – Charles Staats 2012-08-28 16:45:59Z

2 @CharlesStaats I considered putting that in, but I wasn't sure it met the threshold for frequently-usedness. Suppose someone wanted it, but didn't know about it. Then in the "worst" case their operator would appear in italics, which did not seem to me to be a serious problem, or one that would impede the person from completing their post. – MJD 2012-08-28 16:48:13Z

1 I can't speak for others, but I use it all the time (far more often than negative spaces, for instance), and found it extremely annoying to want it before I knew the command. Another point is that this is much more useful in MathJax than in Latex (where one would typically define the new operator in the preamble), so it may be hard to find when looking up resources for latex commands. – Charles Staats 2012-08-28 16:54:44Z

21 It might be useful to mention hanging subscripts for things like `_5C_3` ${}_5C_3$. You could also mention `\frac` vs `\dfrac` . – axblount 2012-08-29 18:09:22Z

2 @axblount I wonder if a more generally useful thing would be to point out that empty groups `{}` count as formulas and can appear anywhere that any other formula can. I think `\dfrac` is a refinement that doesn't need to be mentioned in the main post. – MJD 2012-08-30 01:36:15Z

3 @MJD I agree on both. I guess it's best to avoid the technicalities of typesetting or this will quickly cease to be a "basic tutorial." – axblount 2012-08-30 02:01:12Z

8 My basic idea is that if a beginner can express a formula clearly, then someone else can come in and clean up the typesetting afterwards. I am considering getting rid of the section about `\big` , `\left` , and `\right` for this reason, and trimming the section on spacing. – MJD 2012-08-30 02:06:18Z

9 Most of the references to TeX or LaTeX in this and the answers ought to be to MathJaX (the exception that I can see being the output of Detexify). I know this is a bit pedantic, but would it be alright to correct this? – Andrew Stacey 2012-09-11 14:13:54Z

5 @AndrewStacey Thanks for pointing this out. Let's by all means be as correct as possible, particularly when there's no extra cost. – MJD 2012-09-11 14:15:14Z

4 @MJD Okay, I've had a go (also the answer about arrays). I wonder also whether or not it is worth a sentence at the end pointing out that whilst MathJaX does its best to emulate TeX, it isn't TeX and so while knowing how something is done in TeX gives you a starting point, it isn't a guarantee that the same thing works in MathJaX. (As a case in point, questions about MathJaX are generally *off-topic* over on TeX-SX.) – Andrew Stacey 2012-09-11 14:22:03Z

6 @AndrewStacey I wouldn't. They are close enough that it seems to me to be a needless refinement. I might even argue that MathJax *is* TEX, although an alternative implementation. We're willing to accept that other programming languages (JavaScript, for example) that have slightly incompatible implementations are nevertheless the same language; why not in this case as well? – MJD 2012-09-11 14:35:20Z

11 @MJD Except that this is meant as a tutorial for those who aren't familiar with the distinction (and there really is a distinction: "slightly incompatible implementations" doesn't really fit the bill here). One thing tutorials often include is a "Where to find out more" section. This doesn't. Someone who doesn't know the distinction might be tempted to search for help on TeX or LaTeX instead and wonder why it doesn't work. – Andrew Stacey 2012-09-11 14:40:15Z

6 @AndrewStacey All the tips given here would work in any $TEX/LATEX$ environment with the proper packages. MathJax is just the service used to render it. You wouldn't say "Miktex tutorial" or "texlive tutorial". – axblount 2012-09-11 15:01:30Z

6 @axblount But that's precisely the wrong way around to think about it! The likelihood is that someone will look at this tutorial to figure out how to write something on the Maths-SX site: i.e., to use MathJaX. If they can't find help here, where do they go? If they have the idea that MathJaX is "just a javascript implementation of TeX" then they might think to look for help with TeX, but that is quite possibly *not* going to be helpful. – Andrew Stacey 2012-09-11 15:08:05Z

2 @AndrewStacey Honest question because I have no idea: What sorts of LaTeX math expressions is MathJaX incapable of rendering? – axblount 2012-09-11 16:00:36Z

9 @axblount For a start, you've changed the goalposts: "LaTeX **math** expressions". LaTeX is so much more than just a way of typesetting maths! Second, I don't really know but it wouldn't take me long to cook one up. I don't use MathJaX so I haven't explored it. But I know, for example, that it can't handle catcode changes. Which means that I can't make `(` and `)` *automatically* resizeable. I can in LaTeX. – Andrew Stacey 2012-09-11 16:04:53Z

3 @axblount Anything that requires loading an additional package which MathJax doesn't load (either by default, on our configuration, or impossible to load b/c an implementation hasn't been coded yet). Some random examples include those of `stmaryrd` like `\inplus`, `\boxast`, `\owedge`. – Willie Wong 2012-09-12 13:56:50Z

3 A not-just-random-symbols example of something that works in LaTeX but not in MathJax: LaTeX has the `empheq` package (Link) whose functions are, best as I can tell, not replicated in MathJax. And just for fun I give a MathJax expression that won't render in LaTeX: try `$$ \begin{align} ... \end{align} $$`. – Willie Wong 2012-09-12 14:02:55Z

2 Shoot, the "click the edit link" advice is not very good because users don't get an edit link until they have some reputation. It's unfortunate that new users don't even get a "view source" link. I wonder if that advice should be demoted? – MJD 2012-09-14 02:38:42Z

2 @WillieWong That's cheating. The `alignat` environment is for when aligning stuff when you are *already* in a mathematical environment and would have been a better choice for MathJaX to use here. But it's an important example of the limitations of MathJaX: it is *only* for mathematical formatting. – Andrew Stacey 2012-10-01 09:03:17Z

3 I don't *really* mind \over being mentioned in item 8, but I *had to* replace it with \frac in the first two examples of fractions. What is the difference between \over and \frac? // By the way, I think this post should be tagged `(faq)` but it's stuck on `(faq-proposed)`. – user53153 2013-01-20 01:07:38Z

3 @5PM Okay, but why do you care so much, and why should we care that you care so much? Is there a reason to prefer `\frac` to `\over`? – MJD 2013-01-20 01:14:52Z

3 @MJD The TeX.SE thread to which I linked gives some reasons for preferring \frac. The simplest reason is to maintain consistent format of LaTeX commands, which is the prefix form \command{argument}{maybe more arguments}. For

example, the LaTeX way is \textit{something} while the old TeX way was {\it something}. Same with \frac and \over. // Someone who is used to TeX in one or another way can happily proceed without worrying about what I or anyone else thinks. But someone who's just beginning to learn may well begin with the modern approach. – user53153 2013-01-20 01:21:50Z

3 All those reasons seem to apply to $TEX/LATEX$, but not to MathJax, and not to anything we would likely be doing in MathJax or on this site. For example, the fact that the existence of `\over` complicates the design of macros is completely irrelevant to us here. – MJD 2013-01-20 02:16:52Z

85 I wish I saw this post when I first joined. This post should be a main link on the home page. There should be a button under each box: NEW TO LATEX, CLICK HERE FOR EXAMPLES. This is extremely useful, concise. – user1527227 2013-05-31 18:09:36Z

3 @robjohn I never use `\mathrm`. I can see the value of mentioning `\text`, because beginners often write things like $\{x|xishyperellipticallyconstrained\}$, but `\mathrm` doesn't help here, and I'm not sure why it is a good use of space in the tutorial. Is it important for some reason I don't appreciate? – MJD 2013-06-10 15:58:10Z

15 @MJD: I use `\mathrm` in many places; e.g. dx in integrals and derivatives and for operator names that don't need the full force of `\operatorname`. `\mathrm` was intended for roman symbols in math mode; `\text` was intended for text because of the way it spaces things. See this TEX thread. Since I don't believe we can use preambles in MathJax, we can't use `\DeclareMathOperator`, though we can use `\newcommand`, but that is orthogonal to the use of `\mathrm` vs `\text` for math symbols. – robjohn Mod 2013-06-10 16:23:44Z

1 Another useful resource is Wikipedia's Help:Displaying_a_formula. – r.e.s. 2014-06-29 16:21:52Z

2 Might be late, but when I search "mathjax tutorial" on Google, this meta post is the first result returned. Congrats! – Andrew T. 2015-03-19 07:51:09Z

I think this thread: meta.math.stackexchange.com/questions/20896/... should be linked here. – Surb 2015-06-30 07:40:33Z

2 Wow, this is the first post on main and meta together to reach more than 1k votes. – wythagoras 2015-07-18 16:12:11Z

Why isn't this ∴ up there. therefore should be a must. – user312097 2016-06-01 22:40:32Z

Because it's not important. Someone who doesn't know how to write ∴ will have no trouble thinking of how to write “therefore” instead. – MJD 2016-06-01 23:49:43Z

How to write H is normal in G ? I'm talking about the inverted delta sign. Thanks. – null 2016-07-18 13:49:51Z

@Sayantani It's `\lhd` $\lhd$. I've added this to section 12. – MJD 2016-07-18 14:02:36Z

How do you add a "is proportional to" \propto in a Markdown document? – M. Beausoleil 2016-08-31 02:28:15Z

@user1527227 We kinda did it! math.stackexchange.com/help/notation – Simply Beautiful Art 2016-09-09 22:22:02Z

$\left(\frac{\sqrtx}{y}\right)$ – user167920 2017-12-27 09:20:59Z

For everyone new to Latex, I have recently written a realtime latex editor where you can quickly create your math notations and formulas. Enjoy! – Avatar 2018-01-24 08:57:52Z

What is the purpose of the first paragraph?? – Peter Mortensen 2018-11-25 23:50:17Z

@peter To enable a user of the web site to continue learning on their own from examples that they see on every other post here. – MJD 2018-11-26 00:44:47Z

Is there a comic sans font? I believe the addition of this could have very positive effects on math.stackexchange.com .... – Flinn Bella 2020-01-31 01:11:21Z

this was incredibly help to me after getting nowhere with some LaTeX and Tex Stack Exchange tutorials, online books and other resources! The only thing I was looking for that this didn't cover, and I did see mentioned somewhere in a deep LaTeX reference book was how to make equations bigger, when you have factions with power functions and subscripts it can all end up rather small on SE Mathematics using inline i.e single '$' notation at least. – wide_eyed_pupil 2020-04-17 05:57:07Z

I have finded a very nice site where there are a list of complete command to write in MathJax. Very interesting and very fast: the title is `TeX Commands available in MathJax`.

onemathematicalcat.org/MathJaxDocumentation/TeXSyntax.htm – Sebastiano 2020-07-19 21:54:41Z

1 I noticed that quite a few people on main are using `\backslash` instead of `\setminus` for, well, the operation of setminus. The spacing is different: compare $A\backslash B$ with $A \setminus B$, and `\setminus` is designed for this use. I edited the tutorial to mention this, and also added a link to a TeX.SE question about this. – user1729 2020-10-07 10:59:36Z

1 Is it just me, or does the sentence "There are also other possibilities how to view the code for the formula or the whole post." read badly? I feel that something like "...possibilities for how.." would read better. – user1729 2021-01-26 15:20:02Z

Related: Diagonal lines in table cell on mathjax - Mathematics Meta Stack Exchange – user202729 2021-02-08 12:16:35Z

Perhaps `$\uparrow$` and `$\downarrow$`, ↑ and ↓ could be added too in the section of arrows – Veronica R. M. 2021-03-12 22:05:50Z

Here, we can more express mathematical expression – code_conundrum 2021-08-04 08:29:40Z

@robjohn Hey! Can I add the rest of the \Bbb characters? I have already edited (100th) and completed the other main fonts. – Tyma Gaidash 2021-09-24 02:09:32Z

@MJD Would you mind sharing your reasoning behind revision #102 (i.e. why you rolled back the addition of `\because`)? – iBug 2021-12-10 05:46:05Z

Main reason: nobody ever uses it. Secondary reason: nobody needs it; it's an obscure and inferior replacement for "because". Tertiary reason: we already have links to lists of TeX symbols that include it. – MJD 2021-12-10 12:00:22Z

@AndrewStacey that very same thing happened to me yesterday and then i found this tutorial which was a godsend... "Someone who doesn't know the distinction might be tempted to search for help on TeX or LaTeX instead and wonder why it doesn't work." – Jules Manson 2021-12-12 07:18:41Z

\nsim for not similar. – Lori 2021-12-19 16:28:26Z

$\nsim$ example – Tyma Gaidash 2021-12-19 17:47:01Z

1 @DanBoschen I do not agree with adding ⊛. This page is not meant to be exhaustive, and I don't think ⊛ is described by "Some of the most common". And there are other symbols `\odot,\otimes` ⊙,⊗ that are more common in my experience. – Calvin Khor 2022-04-10 01:18:06Z

@CalvinKhor It is commonly used to denote the circular convolution process, but if there isn't room to include it I understand. – Dan Boschen 2022-04-10 02:25:43Z

@DanBoschen I have never seen that in any math paper or book (but I am young..). Wikipedia's entry on the circular convolution does not have it; it instead uses $*$ which I would say *is* commonly used. I don't feel strongly enough to edit, so I have only voiced my disagreement. – Calvin Khor 2022-04-10 02:32:19Z

@CalvinKhor Here's a very reputable source : ccrma.stanford.edu/~jos/st/Convolution.html (it's common in signal processing applications) – Dan Boschen 2022-04-10 02:35:42Z

OK. In this ScienceDirect link there are many competing notations: $*, \otimes_L, \circledast$; Wikipedia in Convolution uses $*_N$ to distinguish from the usual convolution. Google did show me someone on dsp.SE using ⊛. Someone on TeX.SE also asked in 2017 where it is used. – Calvin Khor 2022-04-10 03:00:09Z

2 @iBug why would you want to teach a newbie to use `\ldots`, and in any case in your example it renders the same as `\dots`? I can see `\lhd` being used but why put it with the euivalence relations? (similar question for `\prec` but IDK when that was added) (And while I'm at it a better edit description would be nice. Even the default one beats your apple) – Calvin Khor 2022-04-27 09:48:12Z

@CalvinKhor There are a lot of symbols added "for completeness". In fact, my edit added `\dots` (where there used to be only `\ldots`). Same for `\lhd` which was already there and I only added `\rhd` and an explanation. – iBug 2022-04-27 09:59:59Z

1 Ah. Sorry for misreading the edit. It would IMO be better to remove mention of `\ldots` and `\cdots` – Calvin Khor 2022-04-27 10:05:28Z

@calvin I agree, including more than one of the dots macros is unnecessary and at least one should be removed. – MJD

2022-04-27 10:53:45Z

1 @ibug "completeness" is not a goal here. It is an anti-goal. The goal is to provide as *little* as possible. – MJD 2022-04-27 10:53:59Z

@MJD I understand how "completeness" is not the goal here, but I find it frustrating if I were to learn `\lt` without `\gt` (just for example). Sure I'll remove `\ldots` but I'd keep `\rhd` though. Same reasoning when I previously added `\gets` and `\impliedby`. – iBug 2022-04-27 11:33:21Z

@iBug What is the difference between \ldots and \dots? – Tyma Gaidash 2022-04-29 01:24:34Z

1 \lhd was in there because it is a very frequently-used symbol in group theory. As far as I know \rhd is not common. And your imagined frustration is not a reliable guide to what should be in the tutorial. It is important that this article be reasonably short and not suffer from too much bloat. – MJD 2022-04-29 06:33:24Z

@TymaGaidash You type one less letter, and otherwise identical. – iBug 2022-04-29 08:05:35Z

1 @TymaGaidash iBug is wrong, both in Mathjax and LaTeX. The difference is that `\dots` tries to intelligently choose between `\ldots` (l for lower) and `\cdots` (c for center) depending on the surrounding text e.g. `a+\ldots+b` $a+\ldots+b$ vs `a+\dots+b` $a+\cdots+b$. – Calvin Khor 2022-04-30 03:00:10Z

@CalvinKhor That's great, thanks, because it means we can get rid of `\cdots`. – MJD 2022-04-30 13:08:13Z

@CalvinKhor My original idea was not to divide up the relations by equivalence / nonequivalence, but to put the elementary arithmetic relations $<, >, \leq, \geq, \neq$ in one place, and the more advanced symbols $\sim, \equiv, \cong, \prec, \lhd$ in another. My sense was that $\succ$ is much less frequently used, and that someone looking for it would be a more advanced user who could guess the name, so I left it out. Over time the first section was bloated with unnecessary additions like `\leqslant` and `\leqq`. – MJD 2022-04-30 13:29:29Z

@MJD Why remove the “if manual adjustments are required” parenthesis section; it was there for some time? – Tyma Gaidash 2022-05-01 00:11:27Z

It has been in there since day 1 in fact. But I don't think it has ever been useful. `\left` and `\right` are good enough for all possible Math SE uses. I think there's no unclear formula anyone could write that would become clear by using `\biggl`. – MJD 2022-05-01 13:51:34Z

@ communitywiki - still I couldn't download this app to my phone. Could you please help me for that? – Janaka Rodrigo 2022-05-02 02:46:22Z

@JanakaRodrigo communitywiki may not be a user, so which app do you mean? – Tyma Gaidash 2022-05-02 02:57:12Z

@ Tyma - I need to use mathjax as suggested by the community but I don't know how to do it in my Samsung phone. Could you please help to overcome this issue. – Janaka Rodrigo 2022-05-02 03:15:07Z

@JanakaRodrigo there is no app. Any smartphone bought in the last 10 years will be able to use Mathjax on this website. There is a shorter tutorial here – Calvin Khor 2022-05-02 04:43:18Z

64 Answers

Sorted by:
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421

Matrices

1. Use `$$\begin{matrix}…\end{matrix}$$` In between the `\begin` and `\end`, put the matrix elements. End each matrix row with `\\`, and separate matrix elements with `&`. For example,

```
$$
\begin{matrix}
1 & x & x^2 \\
1 & y & y^2 \\
1 & z & z^2 \\
\end{matrix}
$$
```

   produces:

$$\begin{matrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{matrix}$$

MathJax will adjust the sizes of the rows and columns so that everything fits.

2. To add brackets, either use `\left…\right` as in section 6 of the tutorial, or replace `matrix` with `pmatrix` $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$, `bmatrix` $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, `Bmatrix` $\begin{Bmatrix} 1 & 2 \\ 3 & 4 \end{Bmatrix}$, `vmatrix` $\begin{vmatrix} 1 & 2 \\ 3 & 4 \end{vmatrix}$, `Vmatrix` $\begin{Vmatrix} 1 & 2 \\ 3 & 4 \end{Vmatrix}$.

3. Use `\cdots` ⋯ `\ddots` ⋱ `\vdots` ⋮ when you want to omit some of the entries:

$$\begin{pmatrix} 1 & a_1 & a_1^2 & \cdots & a_1^n \\ 1 & a_2 & a_2^2 & \cdots & a_2^n \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 1 & a_m & a_m^2 & \cdots & a_m^n \end{pmatrix}$$

4. For horizontally "augmented" matrices, put parentheses or brackets around a suitably-formatted table; see arrays below for details. Here is an example:

$$\left[\begin{array}{cc|c} 1 & 2 & 3 \\ 4 & 5 & 6 \end{array}\right]$$

is produced by:

```
    $$ \left[
\begin{array}{cc|c}
  1&2&3\\
  4&5&6
\end{array}
\right] $$
```

The `cc|c` is the crucial part here; it says that there are three centered columns with a vertical bar between the second and third.

5. For vertically "augmented" matrices, use `\hline` . For example

$$\left(\begin{array}{cc} a & b \\ c & d \\ \hline 1 & 0 \\ 0 & 1 \end{array}\right)$$

is produced by

```
$$
  \begin{pmatrix}
    a & b\\
    c & d\\
  \hline
    1 & 0\\
    0 & 1
  \end{pmatrix}
$$
```

6. For small inline matrices use `\bigl(\begin{smallmatrix} ... \end{smallmatrix}\bigr)` , e.g. $\left(\begin{smallmatrix} a & b \\ c & d \end{smallmatrix}\right)$ is produced by:

```
$\bigl( \begin{smallmatrix} a & b \\ c & d \end{smallmatrix} \bigr)$
```

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edited 2021-11-22 12:27:41Z

Calvin Khor
31.4k 1 21 42

answered
2012-08-28 04:17:33Z

MJD
62.5k 8 41 65

23 This says "End each matrix row with \\". But there is no reason to end the LAST row of the matrix that way. The double backslash means: now go on to the next row. But there isn't any next row after the last one. – Michael Hardy 2014-08-28 05:15:33Z

4 I can't edit, but that could be phrased "Separate matrix rows with \\". – trichoplax 2016-11-18 09:43:47Z

`as in section 6 of the tutorial` ... Which tutorial? Is there a link to this tutorial section? – Tom Hale 2017-05-21 03:35:53Z

@tom The tutorial is at the top of this page. It has numbered sections. – MJD 2017-05-21 17:04:22Z

6 @MichaelHardy but a \\ on every line is harmless, and it makes the editing of matrices easier because swapping with the last line can be done with one quick keystroke in many editors. – Reb.Cabin 2018-02-08 15:18:04Z

Is it possible to get smallpmatrix or something? – linear_combinatori_probabi 2018-08-13 05:49:08Z

There's something strange about the second matrix (right after "produces:"); it seems to render properly as a matrix on this page, but on the revision permalink math.meta.stackexchange.com/revisions/5023/7 it shows up as raw LaTeX in a code block. – j.c. 2021-02-16 21:31:24Z

Degree symbol

37

Standard Mathjax does not yet support a dedicated degree symbol, so here are some of the ways to try and emulate one :

45^\text{o}	renders as	45^{o}	
45^o	renders as	45^{o}	
45^\circ	renders as	45°	
45^{\large\circ}	renders as	$45^{\large\circ}$	
45\unicode{xB0}	renders as	45°	Actual Unicode character
90°	renders as	90°	Using keyboard entry of symbol

The degree symbol for angles is *not* `^\circ` . Although many people use this notation, the result looks quite different from the canonical degree symbol shipped with the font, as seen above.

If your keyboard doesn't have a [°] key, feel free to copy from this post here, or follow these suggestions.

Note that comments below indicate that on some configurations at least, `°` renders inferior to `^\circ` . And I recently had a post of mine edited just for the sake of turning `°` into `^\circ` , indicating that someone felt rather strongly about this. So the suggestion above does seem somewhat controversial at the moment. I maintain that from a semantic point of view, `°` is superior to `^\circ` , and if the rendering suffers from this, then it's a bug in MathJax. After all, LaTeX offers a proper degree symbol in the tex companion fonts, indicating that someone there, too, decided that `^\circ` is not perfect. But if things are broken now, I can't fault people from pragmatically sticking with the rendering they prefer. Personally I prefer semantics, also for the sake of screen readers.

Accessibility

Aside from appearance, one consideration in choosing which notation to use is how it will get parsed by screen readers. For example, ChromeVox reads both `45^\circ` and `45°` as "forty-five degrees", while the other two are pronounced as "forty-five oh", which may be a reason to avoid them.

Usepackage

Commonly in Latex you can `\usepackage{gensymb}` to get the `\degree` symbol, however on Stack Exchange this is not an option. Note that even if you can do this it will typically affect the entire page, which may have side effects for other users. So don't rely on this approach.

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edited 2021-02-26 12:11:44Z

community wiki
10 revs, 6 users 47%
StephenG

2 If mathjax loads siunitx or gensymb, there is then \degree in latex which is the degree symbol. – dustin 2015-02-17 22:29:32Z

1 @dustin: I couldn't find siunitx or gensymb mentioned anywhere in the MatJax source repository. Are they available as some kind of third-party extension? If so, where? Since MathJax is *not* LaTeX, packages can't be loaded unless they have been migrated. By the way, all occurrences of “degree” in the MathJax sources refer to something else, as far as I can tell, so there really doesn't seem to be a `\degree` macro. There should be one, imho. – MvG 2015-02-17 23:39:48Z

2 I am not a mathjax expert. I just know latex. I just gave that suggestion in case they were available. Siunitx would be a great package to have. If you aren't familiar, you will see the advantage by scanning the documentation on ctan. – dustin 2015-02-17 23:43:38Z

15 On my display, ° looks bad and `^\circ` looks good: a.pomf.se/xnlfyg.png – MJD 2015-03-24 21:10:15Z

2 Degree sign can generally be typed by holding down `Alt` and typing `0176` on the numeric keypad. `°` (I don't know how international the actual number is). The leading zero is required. – Joffan 2017-04-19 14:04:53Z

1 @Joffan: 167 is the decimal representation of the Codepoint for ° in Latin 1, Unicode and CP-1252. Without the leading zero, CP-437 gets applied instead, at least in typical English-speaking countries, so you'd use Alt+248 there. The Wikipedia article I linked to already describes those two ways of entering the symbol, and en.wikipedia.org/wiki/Alt_code has some more details. – MvG 2017-04-20 22:24:27Z

How to use Radian (c) , gradian (g) and Steradian (sr) ? And also, Angstrom (though a lenght unit)? – Always Confused 2017-05-21 16:06:17Z

Actually we can write degrees by 90^o (O for Orange, using lowercase o, like 'o'), and it'd render it close to degrees symbol

$$90^o + 30^o + 45^o$$

– user427802 2018-05-31 14:41:10Z

1 @AbhasKumarSinha It looks quite slanty to me. – Tom Hale 2018-06-13 03:57:04Z

3 @StephenG: I'm not happy with your latest edit. I feel that it is not helpful to users if we suggest even more ways to poorly format that symbol (like `^o` imho), or to mention a LaTeX approach just to say it won't work. You deleted the example for `45°`, but kept the sentence talking about it, including the colon. I'm reluctant to revert your edit on a CW page without a conversation, but as it stands I see the edit as a change for the worse. Can we find a combined solution? – MvG 2018-10-08 19:09:06Z

I just wrote a feature request for a `\degree` symbol, since I believe it would be technically easy and conceptually beneficial to have such a symbol defined for the whole site. – MvG 2018-10-08 19:25:31Z

@MvG I have added an entry to the "renders as" table for keyboard entry (which frankly looks awful IMO) but regarding your "unhappiness" note only one line was deleted from the version preceding my first edit and I regard your belief that this justifies your claim my edit was "unhelpful" is nonsense. I fail to see how undoing my edit helps anyone but you.
– StephenG - Help Ukraine 2018-10-10 04:16:09Z

While we're at it, I included my comment on accessibility from the feature request post, since it may be more useful here. It would be nice if other people tested other screen readers to get a sample size of higher than one. – Misha Lavrov 2018-10-10 05:25:08Z

I recently discovered `\mathring` and hence there is a further variant `a\mathring{}` a° which is neither `circ` a° nor the actual unicode symbol a° – Calvin Khor 2021-11-22 02:34:38Z

Overlaying symbols

5

(using negative spacing)

To overlay the $\wedge$ `\wedge` and the $\bigcirc$ `\bigcirc`, to make the Kulkarni Nomizu Product:

Which is `\mathbin{\rlap{\,\wedge}\bigcirc}`.

Just for another example: Overlaying of } `\}` and ÷ `\div`:

Which is `\rlap{\,\,\}}\div`.

The command `\rlap{c1}c2` prints the character `c1` with zero-width on the right-hand side of the current position, so that `c2` overlaps with `c1`. In practice, you might want to

1. choose the widest character as `c2`
2. adjust the horizontal spacing by prepending `c1` with extra horizontal space `\,`.
3. if necessary, wrap up the symbol with `\mathbin` so that MathJax treats the symbol like an operator, and the spacing around the symbol is correct.

As you can see, the number of `\!` is different, for exact overlaying of each symbol. `\!` makes the characters left and right to it move a little bit closer.

e.g, the code `ab` produces ab.
And the code `a\!b` produces ab

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edited 2021-01-13 15:07:09Z

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5 revs, 4 users 55%
user803596

The required horizontal spacing is device dependent. An alternative construct is `\overset{\bullet}{\smash{cup}}`. This introduces a possibly device dependent vertical offset that cannot be adjusted, but I think(??) is always perfectly horizontally centered which is sometimes better. Using `mathbin` one can get $A \mathbin{\overset{\bullet}{\smash{\cup}}} B$ for instance. Somehow a further nesting is needed for a `\bigcup` version: `\operatorname*{\overset{\bullet}{\smash{\overset{}{\bigcup}}}}_1^\infty U_i` $\operatorname*{\overset{\bullet}{\smash{\overset{}{\bigcup}}}}_1^\infty U_i$ – Calvin Khor 2022-07-13 12:59:00Z

Tensor indices

5

```
T^{\alpha\beta}{}_{\gamma\delta}
```

$T^{\alpha\beta}{}_{\gamma\delta}$

```
T^{\alpha \beta}{}_{\gamma\delta}{}^{\lambda}
```

$T^{\alpha\beta}{}_{\gamma\delta}{}^{\lambda}$

So for instance, a $(2, 2)$-tensor would act on two covectors (ω, φ) and two vectors (v,w) to produce a real number like this:

$$[T^{\alpha\beta}{}_{\gamma\delta} e_\alpha \otimes e_\beta \otimes e^\gamma \otimes e^\delta](\omega, \varphi, v, w).$$

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edited 2020-10-19 12:50:37Z

community wiki
6 revs, 2 users 76%
Antoni Parellada

1 This trick of raising nothing to an exponent is also used by some to denote e.g. transposes, `{}^t\! A` yields ${}^tA$
– Calvin Khor 2019-10-31 08:32:11Z

TYPESET FONTS

As mentioned before, you can write `$\mathtt{. . .}$` to generate fonts like A, B, C and etc.

You can also produce these fonts writing `$\verb|. . .|$` which generates the same fonts A, B, C and etc.

And concerning different "angle fonts", `$\angle$` generates $\angle$, `$\measuredangle$` generates $\measuredangle$ and last but not least, `$\sphericalangle$` generates $\sphericalangle$. Also, `$\langle...\rangle$` generates $\langle \dots \rangle$.

Concerning different "approximation fonts", `$\approx$` generates $\approx$ with `$\thickapprox$` generating $\thickapprox$. In addition to that, `$\sim$` generates $\sim$ and `$\thicksim$` generates $\thicksim$ with `$\backsim$` generating $\backsim$.

For a symbol of *contradiction*, you can write `$\Rightarrow\Leftarrow$` to generate $\Rightarrow\Leftarrow$ or you can write `$\unicode{x21af}$` to generate $\unicode{x21af}$, which is read as *Scar* (short for Harry Potter's scar, explaining why it looks like a lightning bolt).

* * *

INEQUALITY SIGNS

You can write `$\lt$` or `$<$` to generate $<$ and `$\gt$` or `$>$` to generate $>$, with `$\le$` or `$\leq$` to generate $\leq$.

You can also produce similar *less than* inequality signs with `$\leqslant$` to generate $\leqslant$ and `$\leqq$` to generate $\leqq$. The same applies for *greater than* inequality signs, for which we just rewrite the command as `$\g...$` instead of `$\l...$` which produces $\geq$, $\geqslant$ and $\geqq$.

By putting in an `n`, we could form commands like `$\ngtr$` to generate $\ngtr$ and `$\nless$` to generate $\nless$ as opposed to `$\not>$` and `$\not<$`.

Also, `$\ngeq$ = $\not\geq$` which generates $\ngeq$ and `$\nleq$ = $\not\leq$`, generating $\nleq$.

Furthermore, putting `slant` at the end of strictly the previous two commands generates $\ngeqslant$ and $\nleqslant$.

* * *

SET CONTAINMENT

You could write `$\not\subseteq$` to generate $\not\subseteq$ or `$\not\supseteq$` to generate $\not\supseteq$.

You can write `$\subsetneq$` to generate $\subsetneq$ and `$\supsetneq$` to generate $\supsetneq$.

Or, you can write `$\subsetneqq$` to generate $\subsetneqq$ and `$\supsetneqq$` to generate $\supsetneqq$.

By striking out the `n` in the previous commands with `qq` at the end, we can generate $\subseteqq$ and $\supseteqq$.

Instead of `$\left\{. . .\right\}$` to generate $\{\dots\}$, you can write `$\lbrace...\rbrace$` to generate the exact same thing. For sets that contain element(s) with a single number or letter, you can also write `$\{. . .\}$` to generate strictly $\{\dots\}$ with no other smaller or larger brace sizes.

As another alternative to denoting the difference of two sets A and B, you can write `$\diagdown$` to generate $\diagdown$ in the set expression, $A \diagdown B$. This command though is mainly used for sets A^n and B^n. There also exists `$\diagup$` = $\diagup$ by the way to denote the division operation as opposed to the ordinary / or `$\div$` = $\div$.

* * *

OLD-STYLE

For old-style notation, you can write `$\eqslantless$` to generate $\eqslantless$ and `$\eqslantgtr$` to generate $\eqslantgtr$. These notations can be used to mean the same as $\leqslant$ and $\geqslant$ which is also the same as $\leq$ and $\geq$, but if used today, they commonly represent a *not much less than* or *not much greater than* inequality sign.

If you want to write that the statement, $x > y$ **and thus** $x \neq y$, *without* any words, then you can write `$x \gvertneqq y$` to generate $x \gvertneqq y$. If, on the other hand, you want to then write the same statement for $x < y$ then you can write `$x \lvertneqq y$` to generate $x \lvertneqq y$.

Suppose you have that $x \in \mathbb{R}$ but $x \neq 0$ $(\star)$ for example (like in this question), one could write it as follows: $x \in \mathbb{R} \setminus \{0\}$ with `$\setminus$` to generate $\setminus$. There is an alternative way of writing $(\star)$, nonetheless.

You can write `$\gtrless$` to generate $\gtrless$ which means *less than and greater than*. If $x \gtrless y$ then x is equal to a number greater than y or less than y. Therefore, $x \in \mathbb{R} \setminus \{0\}$ can also be written as $x \gtrless 0$. You can also write `$\lessgtr$` to generate $\lessgtr$ which essentially means the same thing. The following commands and notation is unnecessary, for their definition is obvious.

`$\gtreqless$` generates $\gtreqless$ and `$\lesseqgtr$` generates $\lesseqgtr$.

`$\gtreqqless$` generates $\gtreqqless$ and `$\lesseqgtr$` generates $\lesseqgtr$.

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edited 2020-10-07 10:52:28Z

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Mr Pie

or $\setminus$ could be used. – user645636 2019-09-14 14:38:02Z

I removed the `\backslash`, as it is different from `\setminus`. The command `\setminus` is a binary operation, which means that it has spacing designed for things like $A\setminus B$, while `\backslash` is just the symbol itself, so $A\backslash B$ is more squashed. See here for more details. – user1729 2020-10-07 10:54:35Z

Is `$\diagdown$` really recommended for difference of sets? 'I'd highly recommend `$\setminus$` instead, both for semantic reasons and for type setting reasons. Shouödn't we adjust this recommendation? – emacs drives me nuts 2022-05-15 15:17:58Z

Fussy spacing issues

158

These are issues that won't affect the correctness of formulas, but might make them look significantly better or worse. Beginners should feel free to ignore this advice; someone else will correct it for them, or more likely nobody will care.

Don't use `\frac` in exponents or limits of integrals; it looks bad and can be confusing, which is why it is rarely done in professional mathematical typesetting. Write the fraction horizontally, with a slash:

Bad	Better
$e^{i\frac{\pi}{2}}$	$e^{i\pi/2}$
$\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin x\,dx$	$\int_{-\pi/2}^{\pi/2} \sin x\,dx$

The `|` symbol has the wrong spacing when it is used as a divider, for example in set comprehensions. Use `\mid` instead:

Bad	Better
$\{x\|x^2 \in \mathbb{Z}\}$	$\{x \mid x^2 \in \mathbb{Z}\}$

When using stretchable delimiters (i.e. with `\left` and `\right`), it may be preferable to use `\,\middle|\,`. This produces a stretchable vertical bar with a little bit of space around it. Another alternative is to use a colon instead.

Bad	Better
$\left\{\frac{m}{n} \mid m,n \in \mathbb{Z}\right\}$	$\left\{\frac{m}{n} \,\middle|\, m,n \in \mathbb{Z}\right\}$

For double and triple integrals, don't use `\int\int` or `\int\int\int`. Instead use the special forms `\iint` and `\iiint`:

Bad	Better
$\int\int_S f(x)\,dy\,dx$	$\iint_S f(x)\,dy\,dx$
$\int\int\int_V f(x)\,dz\,dy\,dx$	$\iiint_V f(x)\,dz\,dy\,dx$

Use `\,` to insert a thin space before differentials; without this TEX will mash them together:

Bad	Better
$\iiint_V f(x)dzdydx$	$\iiint_V f(x)\,dz\,dy\,dx$

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edited 2020-07-08 01:25:46Z

community wiki
11 revs, 4 users 79%
MJD

3 I think the first adjusted fraction looks better than the original, but I don't like the second. In any case, this minor spacing

imbalance is too peripheral to belong in a basic MathJax tutorial IMO. Too likely to scare people away rather than make them feel helped. – hmakholm left over Monica 2012-08-31 21:05:25Z

2 @Henning Do you mean that the fraction example is too unimportant even to appear in an addendum on fussy spacing, or that the fussy spacing article is too unimportant to appear as an addendum to the tutorial? – MJD 2012-08-31 23:57:15Z

2 I was talking specifically about the fraction example. Mostly I'm concerned that somebody will come away thinking, *Eeek! Do I have to worry about THAT to use the site?* But it's also arguable that the disclaimer at the top of the answer ought to take care of that. – hmakholm left over Monica 2012-09-01 21:13:45Z

2 @MJD I like the less space, but what if we want to list the bounds for multiple integrals? Like if we have say 3 integrals and we have 3 separate bounds for each how would we list each one? Or do we have to do \int_bound1^bound2\int_bound3^bound4\int_bound5^bound6?? – TheHopefulActuary 2012-11-19 19:45:35Z

2 @Kyle I think that's exactly what you do in that case. – MJD 2012-11-19 20:09:00Z

30 Worth nothing you can use `\middle` with | to get it to work with `\left` and `\right`, like `\left\{x\middle| \frac{x^2}{2} \in \mathbb{z}\right\}`: $\left\{x\middle|\frac{x^2}{2}\in\mathbb{z}\right\}$ – asmeurer 2013-06-09 22:49:06Z

1 Thanks very much! I wanted to do that, but didn't know how. – MJD 2013-06-10 15:47:15Z

@asmeurer Don't forget the spacing around the bar. – user76284 2018-04-26 19:30:07Z

2 It seems `\middle \mid` doesn't work. What is the correct way to get the right spacing with automatic vertical resizing? – asmeurer 2018-04-26 20:05:34Z

In the case of base e powers I would recommend using $\exp(i\pi/2)$ which is, in my opinion, even better than what's suggested in this post. – mechanicious 2018-06-09 23:08:44Z

@asmeurer I always use `\left\{\, ... \,\middle|\, ... \,\right\}` like in $\left\{ x \in \mathbb{R} \,\middle|\, \frac{x^2}{2} \in \mathbb{Z} \right\}$. – Christoph 2018-12-17 21:14:41Z

Is there a way to make the Greek letters displayed upright (non-italic)?

5

Asked in comment. There is a way using unicode characters, for which one can search here: http://unicode-table.com/en. Normal use of **phi** is `$\phi = ...$`, which gives $\phi =. . ..$
Looking up **phi** on the above site gives a couple of results, if one uses 'Greek Capital Letter Phi' and copy it with 'Click to copy and paste symbol', and use it like
`$Φ = ...$`, the result is $\Phi =. . ..$
One might need to experiment which symbol(s) look(s) right.

Is there a tool to visually edit (prepare) the formulas with pre-defined symbols and paste here?

For some of the formulas one can use a word processor app that supports formula edition. E.g. one can use MS Word to construct the formula, or even better use the existing pre-defined ones, like I did with the Binomial theorem, then simply select it, and copy-paste here between the desired number of $'s:

$$(x + a)^n = \sum_{k=0}^{n} \binom{n}{k} x^k a^{n-k}$$

If it does not look right, it might still be less time to adjust the expression than starting it from scratch, or trying to draw by hand such a thing like the above.

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edited 2020-03-30 18:06:54Z

community wiki
2 revs
Dávid Laczkó

It would be nice to use an upright greek font for the circular ratio, the golden ratio, the Euler–Mascheroni constant, and the Feigenbaum constants, leaving π, ϕ, γ, δ, and α to denote variables. – John Bentin 2020-10-25 13:09:18Z

Commutative diagrams

AMScd diagrams must start with a "require":

```
$\require{AMScd}$
\begin{CD}
A @>a>> B\\
@V b V V= @VV c V\\
C @>>d> D
\end{CD}
```

to get this diagram:

$$\begin{array}{ccc} A & \xrightarrow{a} & B \\ {\scriptstyle b}\downarrow & = & \downarrow{\scriptstyle c} \\ C & \xrightarrow[d]{} & D \end{array}$$

`@>>>` is used for arrow right

`@<<<` is used for arrow left

`@VVV` is used for arrow down

`@AAA` is used for arrow up

`@=` is used for horizontal double line

`@|` is used for vertical double line

`@.` is used for no arrow

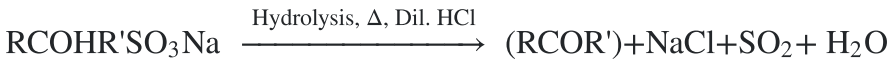
Another example:

```
    \begin{CD}
    A @>>> B @>{\text{very long label}}>> C \\
    @. @AAA @| \\
    D @= E @<<< F
\end{CD}
```

$$\begin{array}{ccccc} A & \longrightarrow & B & \xrightarrow{\text{very long label}} & C \\ & & \uparrow & & \| \\ D & = & E & \longleftarrow & F \end{array}$$

Long labels increase the length of the arrow and in this version also automatically increase corresponding arrows.

```
$\require{AMScd}$
\begin{CD}
  RCOHR'SO_3Na @>{\text{Hydrolysis,$\Delta, Dil.HCl$}}>> (RCOR')+NaCl+SO_2+ H_2O
\end{CD}
```



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edited 2020-01-28 10:52:20Z

community wiki
10 revs, 5 users 68%
Lehs

\begin{CD} RCOHR'SO_3Na @>{\text{Hydrolysis,\Delta, Dil.HCl}>> (RCOR')+NaCl+SO_2+ H_2O \end{CD} Why does this code not give the correct output? – Quark 2016-02-04 10:04:11Z

@Quark: The main error was a missing bracket after HCl. – Lehs 2016-02-04 11:38:56Z

@Lehs Thanks. That was a silly mistake :| What if I wanted to write something below the arrow? Also, could you suggest some online website to learn MathJax? – Quark 2016-02-04 11:58:37Z

@Quark: then you move a > sign: @>>{\text{very long label}}> I learn MathJax from the examples i.e. in this tread. – Lehs 2016-02-04 15:06:46Z

@Lehs Why did you rollback my edit...? You removed the formatting from the list, broke again (in Chrome) the example diagram, and reinserted your duplicate example. Why? – Najib Idrissi 2016-02-04 15:25:16Z

@NajibIdrissi: because your edit appeared as a mess in IE. The diagram wasn't even written out. Maybe there is something wrong in your or in my web-program. Now it looks good in IE. – Lehs 2016-02-04 15:44:02Z

@NajibIdrissi: Now it also looks good in Chrome for Windows and for Android, plus Safari for Androids. I don't know what the problem is with the current version. – Lehs 2016-02-04 15:56:32Z

3 I realize this thread is quite old, but what about diagonal arrows? – A. Thomas Yerger 2017-03-23 05:01:44Z

2 @AlfredYerger: there are no such possibilities in AMScd. – Lehs 2017-09-28 03:57:18Z

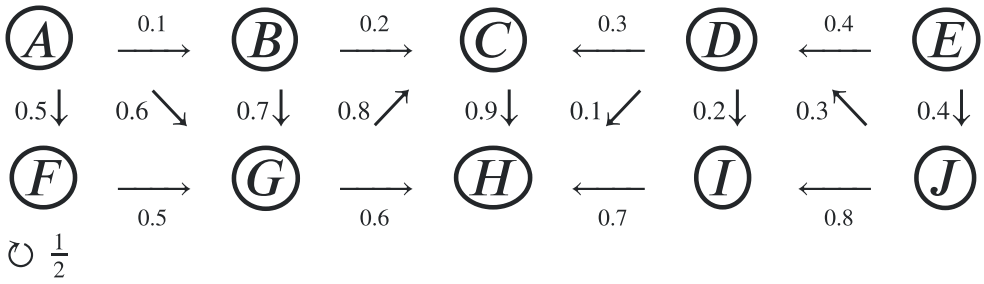
2 @AlfredYerger Maybe presheaf can help there? See also answer and suggestions about this here: How to draw a commutative diagram? – Martin Sleziak 2017-11-06 11:44:21Z

how to draw a double arrow pointing both directions to the left as well as to the right between two points in commutative diagram? – Uncool 2021-03-17 13:43:59Z

Markov Chains

11

This is a heuristic solution for coding Markov chains in Mathjax using a combination of commutative diagrams, the encircle tool and font sizes. There are a few minor issues with this method, for instance the arrows' ends should be attached closer to their targets. Also, it lacks double-headed diagonal arrows and it is difficult to attach probabilities to diagonal arrows. Therefore, it's mostly useful for small chains.




```
\require{enclose}
\begin{array}{ccccccccc}
\Large{\enclose{circle}{A}} & \xrightarrow{0.1} & \Large{\enclose{circle}{B}} &
\xrightarrow{0.2} & \Large{\enclose{circle}{C}} & \xleftarrow{0.3} & \Large{\enclose{circle}
{D}} & \xleftarrow{0.4} & \Large{\enclose{circle}{E}}\\\\
\scriptsize{0.5}\large{\downarrow} & \scriptsize{0.6}\large{\searrow} &
\scriptsize{0.7}\large{\downarrow} & \scriptsize{0.8}\large{\nearrow} &
\scriptsize{0.9}\large{\downarrow} & \scriptsize{0.1}\large{\swarrow} &
\scriptsize{0.2}\large{\downarrow} & \scriptsize{0.3}\large{\nwarrow} &
\scriptsize{0.4}\large{\downarrow}\\\\
\Large{\enclose{circle}{F}} & \xrightarrow[0.5]{} & \Large{\enclose{circle}{G}} &
\xrightarrow[0.6]{} & \Large{\enclose{circle}{H}} & \xleftarrow[0.7]{} &
\Large{\enclose{circle}{I}} & \xleftarrow[0.8]{} & \Large{\enclose{circle}{J}}\\\\
\circlearrowright\tfrac12\\
\end{array}
```

Credit to Zev Chonoles for the commutative diagram.

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edited 2020-06-12 10:07:05Z

community wiki
2 revs
Jam

Is there is code that generates Feynman diagrams? – Daniel Vainshtein 2021-07-12 14:55:11Z

Additional decorations

`\overline` : $\overline{A}\ \overline{AA}\ \overline{AAA}$

`\underline` : $\underline{B}\ \underline{BB}\ \underline{BBB}$

`\widetilde` : $\widetilde{C}\ \widetilde{CC}\ \widetilde{CCC}$

`\widehat` : $\widehat{D}\ \widehat{DD}\ \widehat{DDD}$

`\fbox` : $\boxed{E}\ \boxed{EE}\ \boxed{EEE}$

`\underleftarrow` : $\underleftarrow{F}\ \underleftarrow{FF}\ \underleftarrow{FFF}$ variant: `\xleftarrow{}` : $\xleftarrow{abc}$

`\underrightarrow` : $\underrightarrow{G}\ \underrightarrow{GG}\ \underrightarrow{GGG}$ variant: `\xrightarrow{}` : $\xrightarrow{abc}$

`\underleftrightarrow` : $\underleftrightarrow{H}\ \underleftrightarrow{HH}\ \underleftrightarrow{HHH}$

`\overrightarrow` $\overrightarrow{AB}\ \overrightarrow{ABAB}\ \overrightarrow{ABABAB}$

`\overbrace` : $\overbrace{(n-2)+\overbrace{(n-1)+n+(n+1)}+(n+2)}$

`\underbrace` : $\underbrace{(n-2)+\underbrace{(n-1)}+n+\underbrace{(n+1)}+(n+2)}$

`\overbrace` and `\underbrace` accept a superscript or a subscript, respectively, to annotate the brace. For example, `\underbrace{a\cdot a\cdots a}_{b\text{ times}}` is

$$\underbrace{a\cdot a\cdots a}_{b\text{ times}}$$

Note: `\varliminf` : $\underline{\lim}$ and `\varlimsup` :$\overline{\lim}$ have special symbol of their own.

Single character accents

`\check` : $\check{I}$

`\acute` : $\acute{J}$

`\grave` : $\grave{K}$

`\vec` : $\vec{u}\ \overrightarrow{AB}$ (c.f. `\overrightarrow` above)

`\bar` : $\bar{z}$

`\hat` : $\hat{x}$

`\tilde` : $\tilde{x}$

`\dot \ddot \dddot` : $\dot{x}, \ddot{x}, \dddot{x}$

`\mathring` : $\mathring{A}$

General stacking

If you cannot find your symbol remember that you can stack various symbols using

`\overset{above}{level}` : $\overset{@}{ABC} \overset{x^2}{\longmapsto} \overset{\bullet\bullet\bullet\bullet}{T}$

`\underset{below}{level}` : $\underset{@}{ABC} \underset{x^2}{\longmapsto} \underset{\bullet\bullet\bullet\bullet}{T}$

You can use these together too. You can type $X \overset{a}{\underset{b}{\to}} Y$ with `X\overset{a}{\underset{b}{\to}}Y`.

Arc over points

`\overset{ \huge\frown}{PQ}` : $\overset{\huge\frown}{PQ}$ denotes the arc over points P and Q (As per comment of @Calvin Khor to @Paul Sinclair's question)

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edited 2019-12-30 16:56:41Z

community wiki
11 revs, 7 users 56%
Américo Tavares

Instead of using `$\fbox$`, you could also use `$\boxed{...}$` – Mr Pie 2017-10-19 21:23:12Z

2 added arrows with text variants, some new single char accents and general stacking section. – zwim 2017-10-27 01:42:14Z

4 `stackrel` also seems to work well, as in `\stackrel{\text{def}}{=}` $\longrightarrow \stackrel{\text{def}}{=}$ – Reb.Cabin 2018-02-06 16:48:47Z

Is there a way to do arcs over points, such as to indicate the arc of a curve between two points P and Q? `\widearc {PQ}` doesn't seem to work. – Paul Sinclair 2019-07-29 21:41:52Z

$\frown PQ$ kind of. – user645636 2019-09-13 21:36:56Z

1 The best I've been able to come up with is `\overset{\frown}{PQ}` : $\overset{\frown}{PQ}$. But since `\frown` doesn't adjust in size, it doesn't look right. Does anyone know how get a properly sized arc? – Paul Sinclair 2019-09-20 23:47:54Z

2 @PaulSinclair I offer the following `\overset{\frown}{AB}\overset{ \large\frown}{CD}\overset{\Large\frown}{EF}\overset{ \huge\frown}{GH}\overset{\Huge\frown}{ABC}` $\overset{\frown}{AB}\overset{\frown}{CD}\overset{\frown}{EF}\overset{\frown}{GH}\overset{\frown}{ABC}$ – Calvin Khor 2019-09-22 07:11:11Z

Tables

9

W/ Sub-Variables

After spending too much time searching for a way to make tables of this form (to no avail), I spent even longer searching for the pieces (of which most were found here) to Frankenstein my own. I made this table for a combinatorics q on MSE...

	Ordering	
Repetition	w/	w/o
w/	$P_r^n = n^r$	$C_r^n = \left(\!\!\binom{n}{r}\!\!\right) = \binom{n+r-1}{r}$
w/o	$nPr = \frac{n!}{(n-r)!}$	$nCr = \binom{n}{r} = \frac{n!}{r!(n-r)!}$

W/o Sub-Variables

While searching, I found several tables of this form...

Day	Credit	Debit	Total
0	0	0	10000
1	100	500	9600
2	0	400	10000
3	1000	500	10500

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answered 2019-03-20 05:20:49Z

community wiki Landon

I still consider myself a MathJax novice so please comment any code simplifications/corrections & I'll make the edit. – Landon 2019-03-20 05:21:50Z

1 Related: How do I insert a table when asking a question? – Martin Sleziak 2019-03-20 05:35:10Z

@MartinSleziak That was 1 of the questions I came across while searching for a way to make tables w/ sub-variables. – Landon 2019-03-20 06:17:36Z

Linear programming

Formulation

A theoretical LPP can be typeset as

```
\begin{array}{ll}
\text{maximize}  & c^T x \\
\text{subject to}& d^T x = \alpha \\
&0 \le x \le 1.
\end{array}
```

$$\begin{array}{ll}
\text{maximize} & c^T x \\
\text{subject to}& d^T x = \alpha \\
&0 \le x \le 1.
\end{array}$$

To input a numerical LPP, use `alignat` instead of `align` to get better alignment between signs, variables and coefficients.

```
\begin{alignat}{5}
  \max \quad        & z = &   x_1  & + & 12 x_2  &   &       &         && \\
  \mbox{s.t.} \quad &     & 13 x_1 & + & x_2     & + & 12x_3 & \geq 5  && \tag{constraint 1}
\\
                    &     & x_1    &   &         & + & x_3   & \leq 16 && \tag{constraint 2}
\\
                    &     & 15 x_1 & + & 201 x_2 &   &       & =    14 && \tag{constraint 3}
\\
                    &     & \rlap{x_i \ge 0, i = 1, 2, 3}
\end{alignat}
```

$$\begin{alignat}{5}
\max \quad & z = & x_1 & + & 12x_2 & & & & \\
\text{s.t.} \quad & & 13x_1 & + & x_2 & + & 12x_3 & \geq 5 & \text{(constraint 1)} \\
& & x_1 & & & + & x_3 & \leq 16 & \text{(constraint 2)} \\
& & 15x_1 & + & 201x_2 & & & = 14 & \text{(constraint 3)} \\
& & & & x_i \geq 0, i = 1, 2, 3 & & & &
\end{alignat}$$

We treat max, z, each variable, $\pm$ sign and RHS as one separate column, while leaving an extra empty column on the right. Then we count the number of separators `&`, add one into this number then divide it by two. (e.g. $(9 + 1) \div 2 = 5$)

`\rlap` is used so that the last row spans over one column.

Optional: `\tag` is used to label the constraints.

Change MATLAB/Octave matrices to LaTeX code

To get fractions, execute `format rat` at the beginning.

Writing manually the LaTeX code for a matrix with many rows and columns in Octave is tedious. The Octave function

```
strcat("\\begin{bmatrix}\n",strrep(strrep(mat2str(A)," ","  & "), ...
";"," \\\\\n")(2:end-1),"\n\\end{bmatrix}\n")
```

converts

```
A = [1 2 2; 2 3 4; 4 4 2]
A =

   1   2   2
   2   3   4
   4   4   2
```

to

```
\begin{bmatrix}
1 & 2 & 2 \\
2 & 3 & 4 \\
4 & 4 & 2
\end{bmatrix}
```

so that pasting the generated code gives

$$\begin{bmatrix} 1 & 2 & 2 \\ 2 & 3 & 4 \\ 4 & 4 & 2 \end{bmatrix}.$$

Simplex tableaux

Since the coefficient of the objective value variable z *never* changes, my habit is to omit the z-column to save ink.

Normal simplex tableau

```
\begin{array}{rrrrrr|r}
              & x_1 & x_2 & s_1 & s_2 & s_3 &    \\ \hline
         s_1 &   0 &   1 &   1 &   0 &   0 &  8 \\
         s_2 &   1 &  -1 &   0 &   1 &   0 &  4 \\
         s_3 &   1 &   1 &   0 &   0 &   1 & 12 \\ \hline
             &  -1 &  -1 &   0 &   0 &   0 &  0
\end{array}
```

	x_1	x_2	s_1	s_2	s_3	
s_1	0	1	1	0	0	8
s_2	1	−1	0	1	0	4
s_3	1	1	0	0	1	12
	−1	−1	0	0	0	0

It can be stacked up to give an illustration of the entering of variables at different stages.

```
\begin{array}{rrrrrrr|rr}
      & x_1 & x_2 & s_1 & s_2 & s_3 &  w &    & \text{ratio} \\ \hline
  s_1 &   0 &   1 &   1 &   0 &   0 &  0 &  8 &            - \\
    w & 1^* &  -1 &   0 &  -1 &   0 &  1 &  4 &            4 \\
  s_3 &   1 &   1 &   0 &   0 &   1 &  0 & 12 &           12 \\ \hdashline
      &   1 &  -1 &   0 &  -1 &   0 &  0 &  4 &              \\ \hline
  s_1 &   0 &   1 &   1 &   0 &   0 &  0 &  8 &              \\
  x_1 &   1 &  -1 &   0 &  -1 &   0 &  1 &  4 &              \\
  s_3 &   0 &   2 &   0 &   2 &   1 & -1 &  8 &              \\ \hdashline
```

```
      &   0 &   0 &   0 &   0 &   0 & -1 &  0 &
\end{array}
```

	x_1	x_2	s_1	s_2	s_3	w		ratio
s_1	0	1	1	0	0	0	8	–
w	1^*	-1	0	-1	0	1	4	4
s_3	1	1	0	0	1	0	12	12
	1	-1	0	-1	0	0	4	
s_1	0	1	1	0	0	0	8	
x_1	1	-1	0	-1	0	1	4	
s_3	0	2	0	2	1	-1	8	
	0	0	0	0	0	-1	0	

Dual simplex tableau

```
\begin{array}{rrrrrrrr|r}
             & x_1 & x_2 & x_3 & x_4 & x_5 & x_6 &  x_7 &        \\ \hline
         x_4 &   0 &  -3 &   7 &   1 &   0 &   0 &    2 & 2M  -4 \\
         x_5 &   0 &  -9 &   0 &   0 &   1 &   0 &   -1 & -M  -3 \\
         x_6 &   0 &   6 &  -1 &   0 &   0 &   1 & -4^* & -4M +8 \\
         x_1 &   1 &   0 &   1 &   0 &   0 &   0 &    1 &      M \\ \hline
             &   0 &   1 &   1 &   0 &   0 &   0 &    2 &     2M \\
\text{ratio} &     &     &   1 &     &     &     &  1/2 &
\end{array}
```

	x_1	x_2	x_3	x_4	x_5	x_6	x_7	
x_4	0	-3	7	1	0	0	2	$2M-4$
x_5	0	-9	0	0	1	0	-1	$-M-3$
x_6	0	6	-1	0	0	1	-4^*	$-4M+8$
x_1	1	0	1	0	0	0	1	M
	0	1	1	0	0	0	2	$2M$
ratio			1				1/2	

It can be stacked up to give a theoretical illustration of what happens in the upcoming steps.

	x_1	x_2	x_3	s_1	s_2	s_3	
s_1	-2	0	-2	1	0	0	-60
s_2	-2	-4^*	-5	0	1	0	-70
s_3	0	-3	-1	0	0	1	-27
	8	10	25	0	0	0	0
ratio	-4	$-5/2$	-5				
s_1	-2^*	0	-2	1	0	0	-60
x_2	$1/2$	1	$5/4$	0	$-1/4$	0	$35/2$
s_3	$3/2$	0	$11/4$	0	$-3/4$	1	$51/2$
	3	0	$25/2$	0	$5/2$	0	-175
ratio	$-3/2$		$25/4$				
x_1	1	0	1	$-1/2$	0	0	30
x_2	0	1	$3/4$	$1/4$	$-1/4$	0	$5/2$
s_3	0	0	$5/4$	$3/4$	$-3/4^*$	1	$-39/2$
	0	0	$19/2$	$3/2$	$5/2$	0	-265
ratio					$\dots$		
x_1	1	0	1	$-1/2$	0	0	30
x_2	0	1	$1/3$	0	0	$-1/3$	9
s_2	0	0	$-5/3$	-1	1	$-4/3$	26
	0	0	$41/3$	4	0	$10/3$	-330

Duality

A picture is worth a thousand words.

$$
\begin{array}{lll}
\max & z = c^T x & \\
\text{s.t.} & Ax \le b & \\
& x \ge 0 & \\
& (\mathcal{PC}) & \\
\text{add} \downarrow & \text{slack var} & \\
\max & z = c^T x & \\
\text{s.t.} & Ax + s = b & \\
& x, s \ge 0 & \\
& (\mathcal{PS}) &
\end{array}
\quad
\begin{array}{c}
\text{duality} \\ \rightleftarrows \\ \\ \\ \\ \\ \\ \text{duality} \\ \rightleftarrows \\ \text{some steps skipped}
\end{array}
\quad
\begin{array}{lll}
\min & v = b^T y & \\
\text{s.t.} & A^T y \ge c & \\
& y \ge 0 & \\
& (\mathcal{DC}) & \\
\text{minus} \downarrow & \text{surplus var} & \\
\min & v = b^T y & \\
\text{s.t.} & A^T y - t = c & \\
& y, t \ge 0 & \\
& (\mathcal{DS}) &
\end{array}
$$

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edited 2019-02-16 09:55:35Z

community wiki
3 revs, 2 users 100%
GNUSupporter 8964民主女神 地下教會

3 It must have taken *more* than a thousand words to write *that* picture though :D – Mr Pie 2018-07-20 09:25:28Z

Equation numbering

25

Simple equation

To give an equation a number, use the `\tag{}`. To refer to it later, use `\label{}` to label this equation. When you want to refer to it, use `\eqref{}`. For example,

$$e = mc^2 \tag{1}$$

Equation (1) is one the greatest equations in mankind history. Equation (1) is produced using the following code,

```
$$e=mc^2 \tag{1}\label{eq1}$$
```

To refer to it, use `\eqref{eq1}`.

Multi-line equation

Multi-line equation is actually just one equation rather than several equations. So the correct environment is `aligned` instead of `align`.

$$\begin{aligned} a &= b + c \\ &= d + e + f + g \\ &= h + i \end{aligned} \tag{2}$$

Equation (2) is a multi-line equation. The code to produce equation (2) is

```
$$\begin{equation}\begin{aligned}
a &= b + c \\
  &= d + e + f + g \\
  &= h + i
\end{aligned}\end{equation}\tag{2}\label{eq2}$$
```

Multiple aligned equations

For multiple aligned equations, we use the `align` environment.

$$a = b + c \tag{3}$$
$$x = yz \tag{4}$$
$$l = m - n \tag{5}$$

Equation (3), (4) and (5) are multiple equations aligned together. The code to produce these equations is,

```
$$\begin{align}
a &= b + c \tag{3}\label{eq3} \\
x &= yz \tag{4}\label{eq4}\\
l &= m - n \tag{5}\label{eq5}
\end{align}$$
```

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edited 2018-11-08 19:57:01Z

community wiki
2 revs, 2 users 93%
jdhao

I don't believe there is any difference between *align* and *aligned*, but whatever feels comfortable I suppose. – Mr Pie 2018-02-02 06:12:09Z

There is actaully a difference, read here for a detailed discussions. – jdhao 2018-02-02 06:28:08Z

thank you very much for clearing up that understanding :) – Mr Pie 2018-02-02 06:30:29Z

You are welcome. When in doubt, always google it first :). – jdhao 2018-02-02 06:32:09Z

If there's an equation with multiple lines, is there a way to add tags on a *per-line* basis, i.e. `\tag{1}` for line 1, `\tag{2}` for line 2, etc? If I use the `\tag{...}` commands, I can only use one per equation and it labels the entire equation, not each line. – code_dredd 2019-06-01 20:17:19Z

I am not aware of this kind of command. What is your use case? – jdhao 2019-06-04 02:27:42Z

the last equation numbering can also be used with `align*` instead of `align` – Masacroso 2019-12-02 23:59:26Z

I get all tags on the first line: "a = b + c (3)(4)(5)". – Jiri Kriz 2019-12-13 13:55:37Z

Why do we need both `$$` and `\begin{equation}` with `aligned` ? I noticed that when I omitted `\begin{equation}` that I did not get an equation number, but that does not happen when I use only `$$` without any other environments inside. – Randy Cragun 2021-05-12 20:41:57Z

Pack of cards

46

If you are asking (or answering) a combinatorics question involving packs of cards you can make it look more elegant by using `\spadesuit`, `\heartsuit`, `\diamondsuit`, `\clubsuit` in math mode:

$$\spadesuit \quad \heartsuit \quad \diamondsuit \quad \clubsuit$$

Or if you're really fussy:
`\color{red}{\heartsuit}` and `\color{red}{\diamondsuit}`

$$\color{red}{\heartsuit} \quad \color{red}{\diamondsuit}$$

You can also enter the standard Unicode characters (`U+2660 BLACK SPADE SUIT` etc.) literally, or copy them from here:

♠ ♡ ◇ ♣
♤ ♥ ◆ ♧

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edited 2018-05-29 16:09:38Z

community wiki
3 revs, 3 users 53%
David

1 This is very nice! Is there other auto-shapes or stickers? – Always Confused 2017-05-19 13:37:59Z

1 Is it also possible to draw the spade and club in outlines and fill the heart and diamond with a colour? – Always Confused 2017-05-19 13:39:28Z

2 @AlwaysConfused None that come to mind. Google search turned up this which might help. Otherwise search for a TeX/LaTeX/MathJax symbol table. – David 2017-05-22 23:48:05Z

1 @AlwaysConfused Unicode has those characters, so you can enter them however you normally enter Unicode characters, or you can now use copy-paste to copy them from this answer. – MJD 2018-05-29 16:11:08Z

1 @MJD Not sure that your edit is a good idea, firstly because I think we would prefer questions and answers on MSE to be in MathJax as far as possible, secondly because this page is specifically a MathJax tutorial. However I'm not really bothered - if you still think it's a good idea, let me know and I'll approve the edit. – David 2018-05-30 04:31:36Z

Is there a way to force the heart and diamond suit symbols to be filled, like the club and spade? – code_dredd 2019-06-02 18:39:42Z

@code_dredd See my previous comment in reply to "Always Confused", also the comment by MJD. – David 2019-06-02 22:08:04Z

@David I guess nothing has changed since then... Thanks. – code_dredd 2019-06-02 23:36:16Z

To the above commenters - it is possible, for instance

achieved via the code `$$\color{yellow}♥\!\!\!\color{blue}♡$$` but you will need to fiddle with the number of `\!` s depending on where you put it, because I don't think there is a command in mathJax to place characters on top of each other. Another example, `$$\Huge \color{green}\Huge \color{green}♥\!\!\!\!\!\!\!\!\!\!\!\,\color{red}♡$$` gives

– Calvin Khor 2020-03-28 06:02:03Z

Units

17

While LaTeX has packages that format units, MathJax does not. For visual consistency, one should format units within the same string of MathJax code as the value to which it corresponds, separating the value and unit with `\ ` (space-backslash-space) since the BIPM recommends a small space between the value and units. In addition, follow the below conventions for formatting values and units:

Decimal Separator & Digit Separation

Following the conventions of the English-speaking world, a `.` should be used to separate the decimal part of a number from the integral part, not `,`, as is common in some languages. This is because commas are already reserved for separating mathematical notation such as arguments of multivariate functions, elements of a set, and the coordinates of ordered tuples.

No punctuation should be used to separate multiples of three digits on either side of the decimal separator; instead, a small space rendered by `\,` should be used on both sides of the decimal marker when the string of digits consists of more than four or five digits. For example,

- `4321.1234` 4321.1234
- `54\,321.123\,45` $54\,321.123\,45$
- `0.56789` 0.56789
- `0.567\,89` $0.567\,89$

If you use a decimal separator, you should include a digit on both sides of the separator, even if the digit is simply 0.

Powers of 10

Seeing as we are not calculators, it is preferable to fully write without abbreviation `\times10^{n}` $\times10^{n}$ when scientific or engineering notation is helpful or necessary. Do not precede or follow this markdown with positive nor negative spaces; `\times` takes care of that on its own.

Nevertheless, if necessary, use an upright variant of the letter 'E' or 'e' to indicate order of magnitude, such as

- `\mathrm{E}\,6` $\mathrm{E}\,6$
- `\scriptsize{\mathrm{E}}\,\normalsize{6}` $\scriptsize{\mathrm{E}}\,\normalsize{6}$
- `\mathrm{e}\,6` $\mathrm{e}\,6$

A small space on either side is perfectly fine and recommended.

Single Units

The symbol of any unit—especially SI units—should follow the form `\mathrm{u}`. (I have this command saved under the keyboard shortcut `usin` on my devices.) For example,

- `\mathrm{m}` m
- `\mathrm{kg}` kg
- `\mathrm{ft.}` $\mathrm{ft.}$

Do not use a period with symbolic units; do use a period with abbreviated units.

Units with a Dot Multiplier

Multiplied units conjoined by a dot should follow the form `\mathrm{u}\!\cdot\!\mathrm{v}` $\mathrm{u}\!\cdot\!\mathrm{v}$. (I have this sequence of commands saved under the keyboard shortcut `umul` on my devices.) Because of how `\cdot` is designed (i.e., to separate numbers), the small negative space `\!` on either side maintains uniform spacing throughout the whole compound unit. For example,

- `\mathrm{N}\!\cdot\!\mathrm{m}` $\mathrm{N}\!\cdot\!\mathrm{m}$
- `\mathrm{s}\!\cdot\!\mathrm{A}` $\mathrm{s}\!\cdot\!\mathrm{A}$

Do not use `\times` $\times$ as a separator.

Units with a Solidus Separator

Divided units conjoined by a solidus should follow the form `\left.\mathrm{u}\middle/\mathrm{v}\right.` $\left.\mathrm{u}\middle/\mathrm{v}\right.$. (I have this sequence of commands saved under the keyboard shortcut `udiv` on my devices.) The extra markdown is to ensure that solidus stretches the entire height of the unit, especially when exponents are involved. For example,

- `\left.\mathrm{J}\middle/\mathrm{s}\right.` $\left.\mathrm{J}\middle/\mathrm{s}\right.$
- `\left.\mathrm{m}\middle/\mathrm{s}^2\right.` $\left.\mathrm{m}\middle/\mathrm{s}^2\right.$

You may include small negative spaces `\!` on either side of the solidus if you please.

Exponents

Exponents can be rendered with the standard MathJax markdown. The carat and number should immediately follow the closing brace of the `mathrm{}` argument. For example,

- `\mathrm{m}^2` m^2
- `\left.\mathrm{m}\middle/\mathrm{s}^2\right.` $\left.\mathrm{m}\middle/\mathrm{s}^2\right.$

Parentheses

Parentheses can also be rendered with standard MathJax markdown using `\left(` and `\right)` outside the argument of `\mathrm`. For example,

- `\left.\mathrm{kg}\!\cdot\!\mathrm{m}^2\middle/\left(\mathrm{C}\!\cdot\!\mathrm{s}\right)\right.` $\left.\mathrm{kg}\!\cdot\!\mathrm{m}^2\middle/\left(\mathrm{C}\!\cdot\!\mathrm{s}\right)\right.$

Exponents in Place of Separators

If you prefer to use no separators and only powers, separator each single `\mathrm{}` with a small space `\,` and use exponents as necessary. For example,

- `\mathrm{m}\,\mathrm{s}^{-2}` $\mathrm{m}\,\mathrm{s}^{-2}$
- `\mathrm{s}^{-1}\,\mathrm{mol}` $\mathrm{s}^{-1}\,\mathrm{mol}$

Examples in Context

```
\mu_0=4\pi\times10^{-7} \
\left.\mathrm{\mathrm{T}\!\cdot\!\mathrm{m}}\middle/\mathrm{A}\right.
```

$$\mu_0 = 4\pi \times 10^{-7}\ \mathrm{T\cdot m/A}$$

```
180^\circ=\pi \ \mathrm{rad}
```

$$180^\circ = \pi\ \mathrm{rad}$$

```
N_A = 6.022\times10^{23} \ \mathrm{mol}^{-1}
```

$$N_A = 6.022 \times 10^{23}\ \mathrm{mol}^{-1}$$

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edited 2017-10-17 02:33:35Z

community wiki
2 revs
Chase Ryan Taylor

Mixing code and MathJax formatting on lines

13

To give an example of how this might be useful, I wanted to express an algorithm in more or less the same indentation and symbolic way it appears in a paper.

On my desktop browsers (Chrome, Firefox) the following appears reasonably well spaced and indented, but loses indentation on my Android smartphone:

Input: positive integer n
Output: Tangent numbers $T_1, \ldots, T_n$
$T_1 \leftarrow 1$
`for` k `from` 2 `to` n
    $T_k \leftarrow (k-1)T_{k-1}$
`for` k `from` 2 `to` n
    `for` j `from` k `to` n
        $T_j \leftarrow (j-k)T_{j-1} + (j-k+2)T_j$
`return` $T_1, T_2, \ldots, T_n$.

The source can be examined for specific techniques, but the basic trick is that a MathJax dollar-delimiter can follow a closing back-tick code delimiter, but an opening back-tick should be preceded by a space when following the (closing) dollar-sign delimiter.

Here is a version using `\phantom` rather than code monospacing to produce indents and tweaking the spacing between code and MathJax expressions with `\;` , so that the results appear clear on Android browsers:

Input: positive integer n
Output: Tangent numbers $T_1, \ldots, T_n$
$T_1 \leftarrow 1$
`for` k `from` 2 `to` n
    $T_k \leftarrow (k-1)T_{k-1}$
`for` k `from` 2 `to` n
    `for` j `from` k `to` n
        $T_j \leftarrow (j-k)T_{j-1} + (j-k+2)T_j$
`return` $T_1, T_2, \ldots, T_n$.

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edited 2016-11-06 21:28:31Z

community wiki
3 revs
hardmath

4 But this is why we have `\space` , `\quad` , and `\qquad` – Simply Beautiful Art 2016-11-07 00:41:10Z

2 While those are among the ways LaTeX provides control over spacing, they do not suffice for mixing `code` and MathJax formatting on a line. – hardmath 2016-11-07 01:05:55Z

2 I'm not sure if the topic of mixing other code in is well-suited here. – Simply Beautiful Art 2016-11-07 02:05:34Z

I would write the code in TeX using `\texttt` if I were you. Regardless, this answer probably does not belong here. – pzp 2017-05-21 14:10:36Z

@pzp: Thanks, that is an interesting suggestion. – hardmath 2017-05-22 16:15:33Z

@hardmath you can shorten the `<code></code>` spacers a bit by writing `<codde/>` , at least in my Jupyter notebooks in Chrome. – Reb.Cabin 2018-02-06 22:28:54Z

Vertical Spacing

27

Some formulas such as $\overline{a} + \overline{b} = \overline{a \cdot b}$, $\sqrt{a} - \sqrt{b}$, do not look quite right when it comes to vertical spacing. Fortunately, there is more than one way to fix this. One can for instance employ the `\mathstrut` command as follows:

```
$\sqrt{\mathstrut a} - \sqrt{\mathstrut b}$
```

Which yields: $\sqrt{a} - \sqrt{b}$. Or using `\vphantom` (vertical phantom) command, which measures the height of its argument and places a math strut of that height into the formula.

```
$\sqrt{\vphantom{b} a} - \sqrt{b}$
```

Which renders as: $\sqrt{a} - \sqrt{b}$.

Another issue is with the spacing within lines in situations like this,

> Based on the previous technique, we can simplify $\frac{1}{\sqrt{a} - \sqrt{b}}$, and we thus get the result of the previous limit.

These two lines are too far apart, but this is unnecessary since the second line is very short. We can solve this by using the `\smash` command, to get:

> Based on the previous technique, we can simplify $\frac{1}{\sqrt{a} - \sqrt{b}}$, and we thus get the result of the previous limit.

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edited 2016-09-24 08:43:06Z

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Workaholic

Alternatively, one can also sneak in a rule of zero width `\rule{0pt}{2ex}` , as explained here. – on4aa 2020-04-29 15:06:39Z

On Android, at least, the results of `\smash` look awful. The formula overlaps the text. – dfeuer 2022-03-05 01:10:37Z

Displaystyle and Textstyle

29

Many things like fractions, sums, limits, and integrals display differently when written inline versus in a displayed formula. You can switch styles back and forth with `\displaystyle` and `\textstyle` in order to achieve the desired appearance.

Here's an example switching back and forth in a displayed equation:

```
$$\sum_{n=1}^\infty \frac{1}{n^2} \to
  \textstyle \sum_{n=1}^\infty \frac{1}{n^2} \to
  \displaystyle \sum_{n=1}^\infty \frac{1}{n^2}$$
```

$$\sum_{n=1}^\infty \frac{1}{n^2} \to \textstyle \sum_{n=1}^\infty \frac{1}{n^2} \to \displaystyle \sum_{n=1}^\infty \frac{1}{n^2}$$

It is possible to switch style inline as well:

```
Compare $\displaystyle \lim_{t \to 0} \int_t^1 f(t)\, dt$
versus $\lim_{t \to 0} \int_t^1 f(t)\, dt$.
```

Compare $\displaystyle \lim_{t \to 0} \int_t^1 f(t)\, dt$ versus $\lim_{t \to 0} \int_t^1 f(t)\, dt$.

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answered 2016-09-23 06:02:15Z

community wiki Alexis Olson

4 Oh!! I was always confused on why some people had `\displaystyle` . – Simply Beautiful Art 2016-11-07 00:42:18Z

1 @SimplyBeautifulArt I was always wondering on why the math expressions of some people looked nicer than mine.. – user486983 2018-09-21 21:37:25Z

There is also $\scriptstyle AbC$ `$\scriptstyle{AbC}$` and $\scriptscriptstyle AbC$ `$\scriptscriptstyle{AbC}$` . – emacs drives me nuts 2020-03-05 08:52:29Z

Highlighting equation

To highlight an equation, `\bbox` can be used. E.g,

```
$$ \bbox[yellow]
{
e^x=\lim_{n\to\infty} \left( 1+\frac{x}{n} \right)^n
\qquad (1)
}
$$
```

produces

$$e^x = \lim_{n\to\infty} \left(1+\frac{x}{n} \right)^n \qquad (1)$$

By default, the bounding box is "tight", so it doesn't extend beyond the characters used in the formula. You can add a little space around the equation by adding a measurement after the color. E.g.,

```
$$ \bbox[yellow,5px]
{
e^x=\lim_{n\to\infty} \left( 1+\frac{x}{n} \right)^n
\qquad (1)
}
$$
```

produces

$$e^x = \lim_{n\to\infty} \left(1+\frac{x}{n} \right)^n \qquad (1)$$

To add a border, use

```
$$ \bbox[5px,border:2px solid red]
{
e^x=\lim_{n\to\infty} \left( 1+\frac{x}{n} \right)^n
\qquad (2)
}
$$
```

produces

$$e^x = \lim_{n\to\infty} \left(1+\frac{x}{n} \right)^n \qquad (2)$$

You can do both border and background, as well:

```
$$ \bbox[yellow,5px,border:2px solid red]
{
e^x=\lim_{n\to\infty} \left( 1+\frac{x}{n} \right)^n
\qquad (1)
}
$$
```

produces

$$e^x = \lim_{n\to\infty} \left(1 + \frac{x}{n}\right)^n \qquad (1)$$

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edited 2016-07-04 11:05:21Z

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webbertiger

2 When using constructs like this, please heed the points raised in this discussion on usage of colour. – Lord_Farin 2016-05-20 15:56:17Z

1 This would be a very helpful feature. – Always Confused 2017-05-19 13:36:13Z

Tags & References

94

For longer calculations (or referring to other post's results) it is convenient to use the tagging/labelling/referencing system. To tag an equation use `\tag{yourtag}`, and if you want to refer to that tag later on, add `\label{somelabel}` right after the `\tag`. It is not necessary that `yourtag` and `somelabel` are the same, but it usually is more convenient to do so:

```
$$ a := x^2-y^3 \tag{*}\label{*} $$
```

$$a := x^2 - y^3 \tag{*}$$

In order to refer to an equation, just use `\eqref{somelabel}`

```
$$ a+y^3 \stackrel{\eqref{*}}= x^2 $$
```

$$a + y^3 \overset{(*)}{=} x^2$$

or `\ref{somelabel}`

```
Equations are usually referred to as $\eqref{*}$, but you can also use $\ref{*}$.
```

Equations are usually referred to as (*), but you can also use *.

As you can see, references are even turned into hyperlinks, which you can use externally as well, e.g. like this. Note that you can also reference labels in other posts as long as they appear on the same site, which is especially useful when referring to a question with multiple equations, or when commenting on a post.

~~Due to a bug blocks containing a `\label` will break in preview, as a workaround you can put `$\def\label#1{}$` in your post while editing and remove that on submission - unfortunately this means you won't spot misspelled references before submitting...~~ **~~Just don't forget to remove that `\def` again~~**

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edited 2017-04-13 12:22:07Z

community wiki
3 revs
Tobias Kienzler

11 Also works in comments: `\eqref{*}` yields a clickable (*) – Tobias Kienzler 2013-10-31 10:22:53Z

To enable automatically tagging your queations with incremental numbers, add <script type="text/x-mathjax-config"> MathJax.Hub.Config({TeX: { equationNumbers: {autoNumber: "all"} }}); </script> to your header.
– Gerald Senarclens de Grancy 2016-01-20 20:56:01Z

@GeraldSenarclensdeGrancy That would however yield a global numbering on all answers to one question, not per-answer. And it would break the current expectation of by default not having tags despite using unstarred `\begin{align}` etc.... Though personally I'd agree with this – Tobias Kienzler 2016-01-21 07:19:03Z

5 I'm just curious, is there a way to have the tags on the *left side* of the equation? Something like

$$(1) \qquad \sum_j k$$

But the (1) tag is all the way to the left. – Crescendo 2017-08-26 16:46:49Z

How do we write a tag without brackets (because I want to tag a little square as a box of accomplishment)? – Mr Pie 2017-12-12 01:20:33Z

@user477343 No idea, you could ask at tex.stackexchange.com or see if the manual of amsmath has something... – Tobias Kienzler 2017-12-12 09:30:41Z

@Crescendo You could ask on tex.stackexchange.com for a solution. A workaround could be `\begin{array}{lc}` or similar. – Tobias Kienzler 2017-12-12 09:31:20Z

1 Hey, I figured how to tag without brackets. You simply put what is inside the braces: {\tag*{...}} which I learnt from here ⟶ math.meta.stackexchange.com/questions/27731/... – Mr Pie 2018-01-28 00:42:12Z

`\implies` ($\Longrightarrow$) is a marginally preferable alternative to `\Rightarrow` ($\Rightarrow$) for implication.

86 There's also `\iff` $\Longleftrightarrow$ and `\impliedby` $\Longleftarrow$.

`\to` ($\to$) is preferable to `\rightarrow` or `\longrightarrow` for things like $f\colon A \to B$. The reverse is `\gets` ($\leftarrow$).

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edited 2017-04-13 12:34:32Z

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leonbloy

6 Why is it preferable? – MJD 2013-07-09 20:00:42Z

17 implies looks nicer as the arrow is longer and \to is quicker to right (and it's also what you say in your head while typing it). at least that's what I think. – John Salvatierrez 2013-07-29 13:21:17Z

2 Remember the difference between `\to` and `\mapsto` as in $T : \mathbb{R} \to \mathbb{R},\ x \mapsto x+1$ produced by `T:\mathbb R\to \mathbb R,\; x\mapsto x+1` – yo' 2014-08-25 09:57:17Z

8 I prefer using `\to` when it appears as part of a larger propositional formula, rather than at the top level, i.e. $p \wedge ((q \vee r) \to s)$, because the spacing is similar to that of other binary operators. `\implies` is better for sentence- or clause-level implications, or in displays, i.e.

$$x + 2 = 4 - x \implies x = 1.$$

– Mario Carneiro 2015-02-02 14:22:33Z

I have always used *\Longleftarrow* for *\impliedby*. It generates the same thing anyway, for which the former generates $\Longleftarrow$ and the latter generates $\Longleftarrow$ with *\Leftarrow* $\Leftarrow$ as an alternate for reverse implication. – Mr Pie 2018-01-16 06:47:17Z

@yo' instead of *\mathbb* you could also use *\Bbb* as a matter of fact :) – Mr Pie 2018-01-16 06:53:26Z

Is there a way to add some text above impllies? Such as "by (1)" to refer to another equation that is used for substitution and similar cases. – Alexandros 2019-12-27 22:02:54Z

1 @Alexandros yes `\overset{3.1415}{\underset{26535}{\implies}}` produces

$$\overset{3.1415}{\underset{26535}{\Longrightarrow}}$$

– user645636 2020-02-08 12:12:28Z

Giving reasons on each line of a sequence of equations

53

To produce this:

$$\begin{aligned} v + w &= 0 && \text{Given} && (1)\\ -w &= -w + 0 && \text{additive identity} && (2)\\ -w + 0 &= -w + (v + w) && \text{equations (1) and (2)} \end{aligned}$$

write this:

```
\begin{align}
   v + w & = 0  &&\text{Given} \tag 1\\
   -w & = -w + 0 && \text{additive identity} \tag 2\\
   -w + 0 & = -w + (v + w) && \text{equations $(1)$ and $(2)$}
\end{align}
```

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edited 2016-02-15 18:33:13Z

community wiki
2 revs
David K

1 Using multiple `\tag` commands in my equations causes them to break. It only takes one tag per equation and it labels the entire thing instead of allowing tagging on a *per-line* basis. Any ideas? – code_dredd 2019-06-01 20:19:58Z

@code_dredd The particular formatting in this answer still seems to work. Perhaps you could post your formulas in a new meta question to get help with them. – David K 2019-06-02 05:20:55Z

Why would you use \tag, instead of just using ()? – Some Guy 2021-02-01 21:13:36Z

@SomeGuy First, this is what `\tag` is meant for. It puts the (1) exactly where it should be, at the right margin. Second, if you have an equation like `0 = ax^2+bx+c` and you **just** use `(1)` on it instead of `\tag1`, you end up with $0 = ax^2 + bx + c(1)$. To fix this, instead of `\tag` you have to insert other commands to make enough blank space. Not a net gain, in my opinion. – David K 2021-02-02 00:59:49Z

Definitions by cases (piecewise functions)

245

Use `\begin{cases}…\end{cases}`. End each case with a `\\`, and use `&` before parts that should be aligned.

For example, you get this:

$$f(n) = \begin{cases} n/2, & \text{if } n \text{ is even} \\ 3n+1, & \text{if } n \text{ is odd} \end{cases}$$

by writing this:

```
  f(n) =
\begin{cases}
n/2,  & \text{if $n$ is even} \\
3n+1, & \text{if $n$ is odd}
\end{cases}
```

The brace can be moved to the right:

$$\left.\begin{array}{ll} \text{if } n \text{ is even:} & n/2 \\ \text{if } n \text{ is odd:} & 3n+1 \end{array}\right\} = f(n)$$

by writing this:

```
\left.
\begin{array}{ll}
\text{if $n$ is even:}&n/2\\
\text{if $n$ is odd:}&3n+1
\end{array}
\right\}
=f(n)
```

To get a larger vertical space between cases we can use `\\[2ex]` instead of `\\`. For example, you get this:

$$f(n) = \begin{cases} \frac{n}{2}, & \text{if } n \text{ is even} \\[2ex] 3n+1, & \text{if } n \text{ is odd} \end{cases}$$

by writing this:

```
f(n) =
\begin{cases}
\frac{n}{2},  & \text{if $n$ is even} \\[2ex]
3n+1, & \text{if $n$ is odd}
\end{cases}
```

(An 'ex' is a length equal to the height of the letter `x`; `2ex` here means the space should be two exes high.)

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edited 2016-01-25 22:09:37Z

MichaelChirico
4,020 7 5

answered
2012-08-28 04:34:03Z

MJD
62.5k 8 41 65

@MJD Do we have to use the additional instruction `\displaystyle` when the formulas displayed are more complex ? – jibe 2014-07-01 14:43:00Z

3 @jibs `\displaystyle` is enabled automatically in displays, for example between `$$...$$` . You should not ever have to use it. – MJD 2014-07-01 14:50:45Z

@jibe In general, the separate cases in this notation should be in text style unless they are very very complex (and then, the `{` notation is just wrong anyways). – yo' 2014-08-25 09:53:30Z

can this be written with ascii math instead of latex @MJD – wrufesh 2018-05-24 07:35:42Z

What an absurd function to use as an example. Nobody would ever consider such a function. – samerivertwice 2018-10-30 21:56:39Z

Arbitrary operators

63

If an operator is not available as a built-in command, use `\operatorname{…}`. So for things like

$$\operatorname{arsinh}(x)$$

write `\operatorname{arsinh}(x)` since `\arsinh(x)` will give an error and `arsinh(x)` has wrong font and spacing: $arsinh(x)$.

This was already mentioned in a comment by Charles Staats. You might consider this an addition to the FAQ section on `\lim`, `\sin` and so on.

For operators which need limits above and below the operator, use `\operatorname*{…}`, as in

$$\operatorname*{Res}_{z=1}\left(\frac{1}{z^2-z}\right)=1$$

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edited 2015-09-16 03:13:49Z

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2 revs, 2 users 62%
MvG

1 We can also use {\rm ...}. For example, {\rm arsinh} yields arsinh. – Felix Marin 2014-08-12 00:27:02Z

18 @Felix: `\rm` will change the font but not the spacing. `\operatorname{arsinh}x` renders as "arsinh x" while `{\rm arsinh}x` renders as "arsinh$x$". Notice the added space between operator and operand in the first example, which is missing in the second. On the whole, I'd say that `operatorname` is a lot more in the spirit of semantic markup, declaring *what* you want to write instead of *how* you want to write it, so I'd strongly suggest using this. – MvG 2014-08-13 11:27:56Z

5 Thanks. I didn't know there was a difference between them. I always avoided `operatorname` because it was too long. – Felix Marin 2014-08-13 14:41:01Z

2 Thanks for this. I thought carefully about whether to put `\operatorname` in the main post, and decided to leave it out. The reason is simple: If a beginner omits `\operatorname`, the resulting formula will still be perfectly clear, and a more experienced user will have no trouble inserting the `\operatorname` where it is needed. So including it in the main post would not be a good use of space. – MJD 2014-08-16 06:28:54Z

3 ... I always use "\text{operator }". Hmmm, arsinh x vs arsinh x. – JP McCarthy 2015-02-10 16:48:04Z

4 If you use the same operator many times, I think you can do `\DeclareMathOperator{\arsinh}{arsinh}` at the post's top. Never tried it though... – MickG 2015-08-15 17:28:35Z

What is the code for the last one? – Laxmi Narayan Bhandari 2021-05-27 08:07:48Z

@Laxmi you can right-click on MathJax formulas and select "Show Math As / TeX Commands" to see the code for any formula. You can also click on the date of the edits to see edit history, and in that history use "Side-by-side Markdown" rendering to see the source of the whole post. – MvG 2021-05-27 15:07:06Z

Long division

35

```
$$
\require{enclose}
\begin{array}{r}
                13  \\[-3pt]
4 \enclose{longdiv}{52} \\[-3pt]
     \underline{4}\phantom{2} \\[-3pt]
                12  \\[-3pt]
     \underline{12}
\end{array}
$$
```

$$
\begin{array}{r}
13 \\
4\enclose{longdiv}{52} \\
\underline{4} \\
12 \\
\underline{12}
\end{array}
$$

One important trick shown here is the use of `\phantom{2}` to make a blank space that is the same size and shape as the digit `2` just above it.

This is adapted from https://stackoverflow.com/a/22871404/3466415 (which uses slightly different but not less valid formatting).

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edited 2017-05-23 12:39:35Z

community wiki
6 revs, 3 users 92%
David K

---

10 Synthetic division. Example to find that

$$x^3 - 6x^2 + 11x - 6 = (x - 1)(x^2 - 5x + 6) + 0$$

$$
\begin{array}{c|rrrr}
 & x^3 & x^2 & x^1 & x^0 \\
 & 1 & -6 & 11 & -6 \\
1 & \downarrow & 1 & -5 & 6 \\
\hline
 & 1 & -5 & 6 & \mid 0
\end{array}
$$

```
\begin{array}{c|rrrr}& x^3 & x^2 & x^1 &  x^0\\ & 1 & -6 & 11 & -6\\ {\color{red}1} & \downarrow & 1 & -5 & 6\\ \hline & 1 & -5 & 6 & |\phantom{-} {\color{blue}0} \end{array}
```

– Américo Tavares 2016-08-21 14:32:36Z

---

1 @Maria Mazur For the same example $\dfrac{x^3 - 6x^2 + 11x - 6}{x - 1} = x^2 - 5x + 6$:

$$
\begin{array}{rrrr|l}
x^3 & -6x^2 & +11x & -6 & x-1 \\
-x^3 & +x^2 & & & x^2-5x+6 \\
\hline
 & -5x^2 & +11x & -6 & \\
 & 5x^2 & -5x & & \\
\hline
 & & +6x & -6 & \\
 & & -6x & +6 & \\
\hline
 & & 0 & 0 &
\end{array}
$$

I've used this code `\begin{array}{rrrr|ll} x^3 & -6x^2 & +11x & -6  & x  -  1  \\  -x^3 & +x^2 & & & x^2-5x+6 \\ \hline & -5x^2 & +11x & -6\\ & \phantom{-}5x^2 & -5x & & \\ \hline & & +6x & -6 \\ & & -6x & +6 \\ \hline & & 0 & 0 \end{array}` – Américo Tavares 2019-05-16 20:06:50Z

- Use `\begin{array}…\end{array}` and `\left\{…\right.`. For example, you get this:

$$\begin{array}{c}
a_1x+b_1y+c_1z=d_1 \\
a_2x+b_2y+c_2z=d_2 \\
a_3x+b_3y+c_3z=d_3
\end{array}
\right.$$

by writing this:

```
$$
\left\{
\begin{array}{c}
a_1x+b_1y+c_1z=d_1 \\
a_2x+b_2y+c_2z=d_2 \\
a_3x+b_3y+c_3z=d_3
\end{array}
\right.
$$
```

- Alternatively we can use `\begin{cases}…\end{cases}`. The same system

$$\begin{cases}
a_1x+b_1y+c_1z=d_1 \\
a_2x+b_2y+c_2z=d_2 \\
a_3x+b_3y+c_3z=d_3
\end{cases}$$

is produced by the following code

```
$$\begin{cases}
a_1x+b_1y+c_1z=d_1 \\
a_2x+b_2y+c_2z=d_2 \\
a_3x+b_3y+c_3z=d_3
\end{cases}
$$
```

- To align the `=` signs use `\begin{aligned}...\end{aligned}` and `\left\{…\right.` (see asmeurer's comment)

$$\left\{
\begin{aligned}
a_1x+b_1y+c_1z &= d_1+e_1 \\
a_2x+b_2y &= d_2 \\
a_3x+b_3y+c_3z &= d_3
\end{aligned}
\right.$$

whose code is

```
$$
\left\{
\begin{aligned}
a_1x+b_1y+c_1z &=d_1+e_1 \\
a_2x+b_2y&=d_2 \\
a_3x+b_3y+c_3z &=d_3
\end{aligned}
\right.
$$
```

- To align the `=` signs and the terms as in

$$\begin{cases} a_1x+b_1y+c_1z &= d_1+e_1 \\ a_2x+b_2y &= d_2 \\ a_3x+b_3y+c_3z &= d_3 \end{cases}$$

use `array` with `l` (for "align **left**"; there are also `c` and `r`) parameters

```
$$
\left\{
\begin{array}{ll}
a_1x+b_1y+c_1z &=d_1+e_1 \\
a_2x+b_2y &=d_2 \\
a_3x+b_3y+c_3z &=d_3
\end{array}
\right.
$$
```

- Vertical space between equations. As explained in Definition by cases *to get a larger vertical space between* equations *we can use* `\\[2ex]` *instead of* `\\`. The system

$$\begin{cases} a_1x+b_1y+c_1z = \frac{p_1}{q_1} \\ a_2x+b_2y+c_2z = \frac{p_2}{q_2} \\ a_3x+b_3y+c_3z = \frac{p_3}{q_3} \end{cases}$$

is generated by the following code

```
 $$\begin{cases}
a_1x+b_1y+c_1z=d_1 \\[2ex]
a_2x+b_2y+c_2z=d_2 \\[2ex]
a_3x+b_3y+c_3z=d_3
\end{cases}
$$
```

in comparison with

$$\begin{cases} a_1x+b_1y+c_1z = \frac{p_1}{q_1} \\ a_2x+b_2y+c_2z = \frac{p_2}{q_2} \\ a_3x+b_3y+c_3z = \frac{p_3}{q_3} \end{cases}$$

whose code is

```
 $$\begin{cases}
a_1x+b_1y+c_1z=\frac{p_1}{q_1} \\
a_2x+b_2y+c_2z=\frac{p_2}{q_2} \\
a_3x+b_3y+c_3z=\frac{p_3}{q_3}
\end{cases}
$$
```

- In response to elect's comment. The following code

```
$$ \left\{ \begin{array}{l}
0 = c_x-a_{x0}-d_{x0}\dfrac{(c_x-a_{x0})\cdot d_{x0}}{\|d_{x0}\|^2} + c_x-a_{x1}-
d_{x1}\dfrac{(c_x-a_{x1})\cdot d_{x1}}{\|d_{x1}\|^2} \\[2ex]
0 = c_y-a_{y0}-d_{y0}\dfrac{(c_y-a_{y0})\cdot d_{y0}}{\|d_{y0}\|^2} + c_y-a_{y1}-
d_{y1}\dfrac{(c_y-a_{y1})\cdot d_{y1}}{\|d_{y1}\|^2} \end{array} \right.
$$
```

produces

$$\begin{cases} 0 = c_x - a_{x0} - d_{x0}\dfrac{(c_x - a_{x0})\cdot d_{x0}}{\|d_{x0}\|^2} + c_x - a_{x1} - d_{x1}\dfrac{(c_x - a_{x1})\cdot d_{x1}}{\|d_{x1}\|^2} \\[2ex] 0 = c_y - a_{y0} - d_{y0}\dfrac{(c_y - a_{y0})\cdot d_{y0}}{\|d_{y0}\|^2} + c_y - a_{y1} - d_{y1}\dfrac{(c_y - a_{y1})\cdot d_{y1}}{\|d_{y1}\|^2} \end{cases}$$

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edited 2017-03-16 16:37:13Z

community wiki
11 revs, 2 users 93%
Américo Tavares

5 Is it possible to rotate text? To have a vertical word written in front of the large curly bracket that spans over all the equations? – Steeven 2017-07-03 14:21:52Z

4 @Steeven Go here ⟶ math.meta.stackexchange.com/questions/27798/... – Mr Pie 2018-02-01 04:32:03Z

1 Thank you, @user477343. This would be a useful feature on this list. – Steeven 2018-02-01 14:38:35Z

Aligned equations

297

Often people want a series of equations where the equals signs are aligned. To get this, use `\begin{align}…\end{align}`. Each line should end with `\\`, and should contain an ampersand at the point to align at, typically immediately before the equals sign.

For example,

$$\begin{aligned}
\sqrt{37} &= \sqrt{\frac{73^2-1}{12^2}} \\
&= \sqrt{\frac{73^2}{12^2}\cdot\frac{73^2-1}{73^2}} \\
&= \sqrt{\frac{73^2}{12^2}}\sqrt{\frac{73^2-1}{73^2}} \\
&= \frac{73}{12}\sqrt{1-\frac{1}{73^2}} \\
&\approx \frac{73}{12}\left(1-\frac{1}{2\cdot 73^2}\right)
\end{aligned}$$

is produced by

```
\begin{align}
\sqrt{37} & = \sqrt{\frac{73^2-1}{12^2}} \\
 & = \sqrt{\frac{73^2}{12^2}\cdot\frac{73^2-1}{73^2}} \\
 & = \sqrt{\frac{73^2}{12^2}}\sqrt{\frac{73^2-1}{73^2}} \\
 & = \frac{73}{12}\sqrt{1 - \frac{1}{73^2}} \\
 & \approx \frac{73}{12}\left(1 - \frac{1}{2\cdot73^2}\right)
\end{align}
```

The usual `$$` marks that delimit the display may be omitted here.

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edited 2015-04-22 07:36:56Z

answered 2012-08-28 04:28:50Z

MJD
62.5k 8 41 65

7 The AMS's Short Math Guide recommends the `align` environment over `eqnarray` in LaTeX. In MathJax the spacing seems to be the same , but `align` requires one less ampersand per line. – user856 2012-08-28 04:41:28Z

3 Thanks. I was not sure whether to discuss that. A detailed argument against `eqnarray` is in this article. – MJD 2012-08-28 04:51:19Z

Would you mind if I changed your example to use `align` then? – user856 2012-08-28 05:34:34Z

@Rahul: Please go ahead and change anything that seems good to change. This is all CW. – MJD 2012-08-28 05:44:14Z

Also, if you think you have a better example, please use it; I used the first one I found. – MJD 2012-08-28 05:49:28Z

7 Correct me if I'm wrong, but I don't believe the $$ is necessary before and after the \begin{align}. I've certainly never used it. From experience, the \begin{align} puts you into math-display mode by itself. – TravisJ 2015-04-21 12:24:52Z

7 I sometimes find that one line of this environment is too close to another, making them uncomfortable to read. The interline spacing can be adjusted by using input such as `\\[1ex]` instead of `\\` . (And of course the `1` can be changed to another value such as `1.5` or `.7` in order to get enough space but not too much.) – David K 2016-01-30 16:29:47Z

Note - in Jekyll I had to add an additional `\\` to break lines. – baxx 2016-05-24 17:45:27Z

3 @MJD i put the equation:

```
\begin{align} f(x)&=\left(x^3\right)+\left(x^3+x^2+x^1\right)+\left(x^3+x^2\right)\\ f'(x)&=\left(\left(3x^2+2x+1\right)+\left(3x^2+2
```

but the third & is a problem: according to Mathjax, it does not go there. then when i remove it, it says that "a missing close brace or unclosed brace" is present. what am i doing wrong? – Alexander Day 2017-04-26 21:25:10Z

5 @AlexanderDay How did you used that boxed quote? What are commands or formats for it? – Always Confused 2017-05-21 15:53:59Z

@AlexanderDay I notice that right after your second `&=`, you have two instances of `\left(` in a row, and one of them is not closed. Removing one of them, I get:

$$f(x) = \left(x^3\right) + \left(x^3 + x^2 + x^1\right) + \left(x^3 + x\,2\right)$$
$$f'(x) = \left(3x^2 + 2x + 1\right) + \left(3x^2 + 2x\right)$$
$$f''(x) = (6x + 2)$$

Is that what you expected? – Dan Henderson 2017-10-02 13:31:06Z

3 @AlwaysConfused the box delimits a MathJax formula with a syntax error. – Dan Henderson 2017-10-02 13:32:03Z

There is a difference between `aligned` and `align` environment. Equation above are just one equation with different representations, rather than multiple aligned equations. I think the correct environment is `aligned`. – jdhao 2018-01-26 01:40:35Z

1 The `align*` variation does two things differently: left-aligns the equations and omits equation numbers; the regular `align` environment centers the equations and puts an equation number on each line, at least in my version of Jupyter notebooks. – Reb.Cabin 2018-02-06 19:24:02Z

@Reb.Cabin I think the thing is that this is MathJaX. When I am writing stuff in LaTeX I always use align*, but I cannot see the difference between align and align* here, in MathJaX world. – user1729 2018-08-14 14:36:28Z

Is there a way to do nested alignments? – Nicholas Cousar 2018-08-30 23:06:37Z

Often you'll want to add non-aligned text (as an small explanation), is there a command to do so whilst in the align environment? normally i would use \noalign{\text{***text***}} but this doesnt seem to work. – Vaas 2020-03-21 06:25:28Z

How can I left align in one line?It centers default. – 上山老人 2020-06-28 01:14:31Z

update link to Short Math Guide – Delfino 2021-01-13 17:05:05Z

pandoc (or the underlying tex2pdf) actually complains if the \begin{align} is preceded by $$ – TKH 2021-04-18 07:01:06Z

Using `\newcommand`

92

I would like to remark that it is possible to define LaTeX commands as you do in your TeX files. I felt so happy when I first discovered it! It's enough to insert something like

```
$ \newcommand{\SES}[3]{ 0 \to #1 \to #2 \to #3 \to 0 } $
```

at the top of your post (remember the dollars!). Then you can just use your commands as you are used to do: in my example typing `$$ \SES{A}{B}{C} $$` will produce the following:

$$0 \to A \to B \to C \to 0$$

It's also possible to use plain `\def` :

```
\def\ses#1#2#3{0 \to #1 \to #2 \to #3 \to 0}
```

and then `$\ses{A}{B}{C}$` will produce the same output.

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edited 2015-02-12 12:43:56Z

community wiki
3 revs, 3 users 67%
Abramo

11 Be aware that this affects the entire post, possibly even the frontpage, so it should be used with great care. – AlexR 2015-02-21 20:55:06Z

1 \SES123 – ericw31415 2018-05-07 22:03:10Z

5 @AlexR It's been fixed since. – iBug 2019-04-10 03:40:55Z

This unfortunately doesn't work in stackedit.io which I sometimes use to compose and edit longer stackexchange posts. Anyone aware of possible workarounds or alternatives? – joseville 2022-01-07 18:19:23Z

Arrays

166

It is often easier to read tables formatted in MathJax rather than plain text or a fixed width font. Arrays and tables are created with the `array` environment. Just after `\begin{array}` the format of each column should be listed, use `c` for a center aligned column, `r` for right aligned, `l` for left aligned and a `|` for a vertical line. Just as with matrices, cells are separated with `&` and rows are broken using `\\`. A horizontal line spanning the array can be placed before the current line with `\hline`.

For example,

n	Left	Center	Right
1	0.24	1	125
2	−1	189	−8
3	−20	2000	$1+10i$

```
$$
\begin{array}{c|lcr}
n & \text{Left} & \text{Center} & \text{Right} \\
\hline
1 & 0.24 & 1 & 125 \\
2 & -1 & 189 & -8 \\
3 & -20 & 2000 & 1+10i
\end{array}
$$
```

Arrays can be nested to make an array of tables.

For example,

min	0	1	2	3
0	0	0	0	0
1	0	1	1	1
2	0	1	2	2
3	0	1	2	3

max	0	1	2	3
0	0	1	2	3
1	1	1	2	3
2	2	2	2	3
3	3	3	3	3

Δ	0	1	2	3
0	0	1	2	3
1	1	0	1	2
2	2	1	0	1
3	3	2	1	0

As the source for the preceding array is long, please right-click on one of the tables and choose Show Math As ▶ TeX Commands.

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edited 2014-08-28 05:17:27Z

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8 revs, 6 users 47%
robjohn

13 You'll have to wrap the contents of each cell in `\text` if you don't want *allitalics*, *weird* – *lookingspacing*, *an′ oddapostrophes* . – user856 2012-08-29 21:30:33Z

@RahulNarain: True. I used words just for illustration, but I guess the example was slightly misleading. If you'd like to modify it please go ahead. – axblount 2012-08-29 22:00:51Z

2 Thanks! I like your numeric example better, since the widths of the entries are different enough that the alignment differences are visually clear. – MJD 2012-08-30 01:37:12Z

@robjohn how do you use | while typing , i don't find it in my keyboard..... – ABC 2013-03-28 12:05:05Z

@exploringnet: on my keyboard, it is the shifted backslash. It may be in different places (or absent) depending on your keyboard. On my mobile device (iPhone), it is in the shifted numerics, to the right of the backslash. In mathmode, `\vert` gives | and `\mid` gives ∣, but neither works in the column spec for an array. If you cannot type it on your keyboard, you can alwaays copy and paste it from another document. – robjohn Mod 2013-03-28 17:39:50Z

It should perhaps be mentioned, that in nested arrays there seems to be no option to synchronize column-widths and/or row-heights over the top-level. I didn't find a solution such that if two arrays are stacked vertically one could make their column-widths matching/fit. – Gottfried Helms 2013-08-26 09:16:52Z

5 This could also be convenient for some people, althought it destroys the joy of writing tables in $\LaTeX$ by hand!
– nullgeppetto 2014-06-03 14:18:39Z

@Rahul: why did regulars not press developers to enhance HTML formatting instead of doing inconvenient and resource-devouring detours through MathJax? When a table contains (mostly) formulæ, the use of a formula-formatting engine looks determined. But when one wants *just a table,* why should it run software with completely different purpose? I once tried to speak about it at meta.SE, but was gagged. – Incnis Mrsi 2014-12-03 12:11:24Z

@IncnisMrsi What kind of pressure could we apply: bribery, threats, kidnapping? A feature request was made, supported by SE communities, and declined by SE (on technical grounds, as they say). At least we have the MathJax workaround, with all of its flaws: SO and others have nothing. – user147263 2014-12-03 15:55:28Z

8 **Center Aligned Table Captions with Left Aligned Contents**

Bad	Better
$e^{i\frac{\pi}{2}}$	$e^{\frac{i\pi}{2}}$
$\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin x\,dx$	$\int_{-\pi/2}^{\pi/2} \sin x\,dx$

– GNUSupporter 8964民主女神 地下教會 2016-12-12 16:41:08Z

P.S. Table copied from MJD's example below so as to make an example with cells much wider than the caption.
– GNUSupporter 8964民主女神 地下教會 2016-12-12 16:47:42Z

@MJD Is there any command for a vertical line, like \hline ? The `{cc|c}` part in the array code is confusing.
– Tyma Gaidash 2022-05-14 16:50:53Z

Absolute values and norms

55

The absolute value of some expression can be denoted as `\lvert x\rvert` or, more generally, as `\left\lvert … \right\rvert`. It renders as $|x|$.

The norm of a vector (or similar) can be denoted as `\lVert v\rVert` or, more generally, as `\left\lVert … \right\rVert`. It renders as $\|v\|$. (You may also write `\left\|…\right\|` instead.)

In both cases, the rendering is better than what you'd get from `|x|` or `||v||`, which render with bars that don't descend low enough and sub-optimal spacing. At least on some browsers, so here is a screenshot how it looks for me, using Firefox 31 on OS X:

And here is the same formula rendered by your browser:

$$|x|, ||v|| \quad\longrightarrow\quad \lvert x\rvert, \lVert v\rVert$$

It was typeset as

```
$$|x|, ||v|| \quad\longrightarrow\quad \lvert x\rvert, \lVert v\rVert$$
```

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edited 2014-08-13 11:59:30Z

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MvG

8 You can use `\|x\|` instead of `\lVert x \rVert`; $\|x\|$ and $\|x\|$. (I don't think that there is a difference between them. I've tried [asking on SE](tex.stackexchange.com/questions/77767/whats-the-correct-way-to-write-norm).) – Martin Sleziak 2014-06-24 08:48:55Z

On my browser `|x|` and `\lvert x\rvert` ($|x|$ and $|x|$) look identical, contrary to your claim. Perhaps you need to show an example more complicated than just 'x'? – MJD 2014-06-24 12:39:14Z

@MJD: What's your browser? I included a screenshot to support my claim. – MvG 2014-08-13 11:24:04Z

Usually various versions of Firefox on either Linux or Windows. I happen to have Windows 8 booted now, so here's a screenshot from there: a.pomf.se/jrujkq.PNG The bar height looks good on both pairs of symbols; the spacing is a little off for the `||` version. On Linux they looked the same. – MJD 2014-08-13 17:02:16Z

Here's a screenshot with FF 31.0 under Linux: a.pomf.se/fhwmjo.png – MJD 2014-08-16 06:23:32Z

4 The difference in output that you are seeing has to do with whether you have the STIX fonts installed locally on your computer or not. The `|` in STIX doesn't descend below the baseline, while in the MathJax TeX fonts it does. – Davide Cervone 2016-05-20 14:16:56Z

Colors

117

Named colors are browser-dependent; if a browser doesn't know a particular color name, it may render the text as black. The following colors are standard in HTML4 and CSS2 and should be interpreted the same by most browsers:

`\color{black}{text}`	*text*
`\color{gray}{text}`	*text*
`\color{silver}{text}`	*text*
`\color{white}{text}`	*text*
`\color{maroon}{text}`	*text*
`\color{red}{text}`	*text*
`\color{yellow}{text}`	*text*
`\color{lime}{text}`	*text*
`\color{olive}{text}`	*text*
`\color{green}{text}`	*text*
`\color{teal}{text}`	*text*
`\color{aqua}{text}`	*text*
`\color{blue}{text}`	*text*
`\color{navy}{text}`	*text*
`\color{purple}{text}`	*text*
`\color{fuchsia}{text}`	*text*

HTML5 and CSS 3 define an additional 124 color names that will be supported on many browsers.

Math Stack Exchange's default style uses a light-colored page background, so avoid using light colors for text. Stick to darker colors like maroon, green, blue, and purple, and remember also that 7–10% of men are color-blind and have difficulty distinguishing red and green.

The color may also have the form `#rgb` where *r*, *g*, *b* are in the range or `0 – 9`, `a – f` and represent the intensity of red, green, and blue on a scale of 0– 15, with `a` =10, `b` =11, ... `f` =15. For example:

#000	*text*			#00F	*text*		
		#0F0	*text*			#0FF	*text*
#F00	*text*			#F0F	*text*		
		#FF0	*text*			#FFF	*text*

#000	*text*	#005	*text*	#00A	*text*	#00F	*text*
#500	*text*	#505	*text*	#50A	*text*	#50F	*text*
#A00	*text*	#A05	*text*	#A0A	*text*	#A0F	*text*
#F00	*text*	#F05	*text*	#F0A	*text*	#F0F	*text*
#080	*text*	#085	*text*	#08A	*text*	#08F	*text*
#580	*text*	#585	*text*	#58A	*text*	#58F	*text*
#A80	*text*	#A85	*text*	#A8A	*text*	#A8F	*text*
#F80	*text*	#F85	*text*	#F8A	*text*	#F8F	*text*
#0F0	*text*	#0F5	*text*	#0FA	*text*	#0FF	*text*
#5F0	*text*	#5F5	*text*	#5FA	*text*	#5FF	*text*
#AF0	*text*	#AF5	*text*	#AFA	*text*	#AFF	*text*
#FF0	*text*	#FF5	*text*	#FFA	*text*	#FFF	*text*

You can have a look here for quick reference on colors in HTML.

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edited 2014-08-11 18:54:17Z

community wiki
6 revs, 3 users 70%
MJD

12 We should add that colors can be used on items other than text, such as variables and operators. The '\color' command applies to the next item: surround anything longer with braces. – Rory Daulton 2015-02-21 20:30:10Z

1 One can in fact use any CSS-compatible colour specification here, including `rgb`, `rgba`, `hsl`, and `hsla` colours. (I'd edit the answer, but have no time now. Maybe later, if nobody else beats me to it.) – Harald Hanche-Olsen 2018-10-11 14:31:26Z

Crossing things out

135

Use `\require{cancel}` in the first formula in your post that requires cancelling; you need it only once per page. Then use:

`y+\cancel{x}`	$y+\cancel{x}$
`\cancel{y+x}`	$\cancel{y+x}$
`y+\bcancel{x}`	$y+\bcancel{x}$
`y+\xcancel{x}`	$y+\xcancel{x}$
`y+\cancelto{0}{x}`	$y+\cancelto{0}{x}$
`\frac{1\cancel9}{\cancel95} = \frac15`	$\frac{1\cancel{9}}{\cancel{9}5} = \frac{1}{5}$

Use `\require{enclose}` for the following:

`\enclose{horizontalstrike}{x+y}`	$\enclose{horizontalstrike}{x+y}$
`\enclose{verticalstrike}{\frac xy}`	$\enclose{verticalstrike}{\frac xy}$
`\enclose{updiagonalstrike}{x+y}`	$\enclose{updiagonalstrike}{x+y}$
`\enclose{downdiagonalstrike}{x+y}`	$\enclose{downdiagonalstrike}{x+y}$
`\enclose{horizontalstrike,updiagonalstrike}{x+y}`	$\enclose{horizontalstrike,updiagonalstrike}{x+y}$

`\enclose` can also produce enclosing boxes, circles, and other notations; see MathML `menclose` documentation for a complete list.

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edited 2014-08-04 15:20:20Z

community wiki
4 revs
MJD

24 Can I use `\enclose{counterstrike}` ?:P – Akiva Weinberger 2015-07-27 19:19:32Z

59 That sneaky $19/95 = 1/5$. Nice one! – Darth Geek 2015-12-08 23:57:23Z

28 I see you can further resolve existing resolutions, $\cancelto{x^{2+x}}{x^2+4}$ – alan2here 2016-05-01 02:40:03Z

2 Is `enclose` a LaTeX package, or only a MathML option? – Tim Thayer 2016-11-04 18:51:52Z

2 Here is a related post on meta: Striking out equations. – Martin Sleziak 2019-03-20 03:15:10Z

Nice command to make an arrow: $\cancelto{}{}$ `\cancelto{}{}` – user803596 2020-07-21 11:32:08Z

Limits

73

To make a limit (like $\lim_{x\to 1}\frac{x^2-1}{x-1}$), use this syntax:

First, start off with `$\lim` . This renders as lim. The backslash is there to prevent things like *lim*, where the letters are slanted.

Second, add `\limits_{x \to 1}` inside. The code now looks like `$\lim \limits_{x \to 1}$` , and renders as $\lim_{x\to 1}$. The `\to` inside makes the right arrow, rendered as →. The `_` makes the $x \to 1$ go underneath the lim. Finally, the pair of curly braces `{ }` makes sure that $x \to 1$ is treated as a whole object, and not two separate things.

Lastly, add the function you want to apply the limit to. To make the limit mentioned above, $\lim_{x\to 1}\frac{x^2-1}{x-1}$, simply use `$\lim\limits_{x \to 1} \frac{x^2-1}{x-1}$` .

And that is how you make a limit using MathJax.

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edited 2014-07-17 12:25:26Z

community wiki
2 revs, 2 users 94%
JChau

27 Why not just `\lim_{x\to 1}`

$$\lim_{x\to 1}?$$

As I understand it `\limits` is only needed for operations that don't already understand limits, for example if you want to use `+` and get

$$\overset{k}{\underset{i=1}{+}} \text{ instead of } +_{i=1}^{k}$$

When used inline, your suggestion will produce $\lim\limits_{x\to 1}$ instead of the more compact form $\lim_{x\to 1}$ that mathjax normally chooses. Are you sure this is good advice? – MJD 2014-02-26 14:10:28Z

4 @MJD `$\lim_{x\to 1}` renders to $\lim_{x\to 1}$, and `$\lim\limits_{x\to 1` renders as $\boxed{\lim\limits_{x\to 1}}$. Note how the $x \to 1$ is separated from the first limit, and not directly underneath. We do not write limits like that in real life, so we use `\limits` . – TrueDefault 2014-02-26 16:19:01Z

2 I meant that the second limit renders to $\lim\limits_{x\to 1}$ – TrueDefault 2014-02-26 16:28:04Z

9 Limits are usually written that way in typeset materials like papers and books when the limit is inline, rather than a displayed formula, and that's why MathJax typesets it that way. – MJD 2014-02-26 16:41:44Z

13 The issue with this answer is that it is trying to "force" display mode on inline code. Doing so makes the text look less pretty. For example, see how the spacing between the lines change when I force display mode using `\lim\limits_{x\mapsto 1}\dfrac1x` : $\lim\limits_{x\mapsto 1}\dfrac{1}{x}$. On the other hand, when I let TEX do what it wants to do, using `\lim_{x\mapsto 1}\frac1x` , the spacing between the lines stays the same, which is much neater: $\lim_{x\mapsto 1}\frac{1}{x}$. This is much easier on the eyes. If you want to make your math mode more prominent then take a new line using `$$-$$` – user1729 2014-07-17 12:30:53Z

8 The moral is: TEX was written by a jolly clever chap. Let it do what it wants, because it does it for a reason! – user1729 2014-07-17 12:35:21Z

2 Part 11 of the "question" shows how to write limits in the way they were meant to be written in LaTeX and MathJax. – David K 2015-11-14 23:17:19Z

Left and Right Implication Arrows

42

Another way to display the arrows for right and left implication instead of using

`$\Rightarrow$`, `$\Leftarrow$` and `$\Leftrightarrow$`

which produces $\Rightarrow$, $\Leftarrow$ and $\Leftrightarrow$ respectively, you can use

`$\implies$` for $\implies$, `$\impliedby$` for $\impliedby$ and `$\iff$` for $\iff$

The latter of which produces longer arrows which may be more desirable to some.

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edited 2014-05-06 22:15:57Z

community wiki
3 revs, 2 users 74%
jnh

Big braces

Use `\left` and `\right` to make braces - (round), [square] and {curly} - scale up to be the size of their arguments. Thus

```
$$
f\left(
   \left[
     \frac{
       1+\left\{x,y\right\}
     }{
       \left(
          \frac{x}{y}+\frac{y}{x}
       \right)
       \left(u+1\right)
     }+a
   \right]^{3/2}
\right)
$$
```

renders as

$$f\left(\left[\frac{1+\{x,y\}}{\left(\frac{x}{y}+\frac{y}{x}\right)(u+1)}+a\right]^{3/2}\right).$$

Note that curly braces need to be escaped as `\{ \}`.

If you start a big brace with `\left` and then need to match that to a `\right` brace that's on a different line, use the forms `\right.` and `\left.` to make "shadow" braces. Thus,

```
$$
\begin{aligned}
a=&\left(1+2+3+  \cdots \right. \\
& \cdots+ \left. \infty-2+\infty-1+\infty\right)
\end{aligned}
$$
```

renders as

$$\begin{aligned}a =&(1+2+3+\cdots \\ &\cdots+\infty-2+\infty-1+\infty)\,.\end{aligned}$$

There is also a `\middle` construct which is useful when one has a mid-expression brace which must also scale up:

```
$$
\left\langle
  q
\middle\|
  \frac{\frac{x}{y}}{\frac{u}{v}}
\middle|
   p
\right\rangle
$$
```

renders as

$$\left\langle q \middle\| \frac{\frac{x}{y}}{\frac{u}{v}} \middle| p \right\rangle .$$

Note that constructs like `\left\langle`, `\left|` and `\left\|` are also possible.

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answered 2013-10-25 17:47:09Z community wiki
E.P.

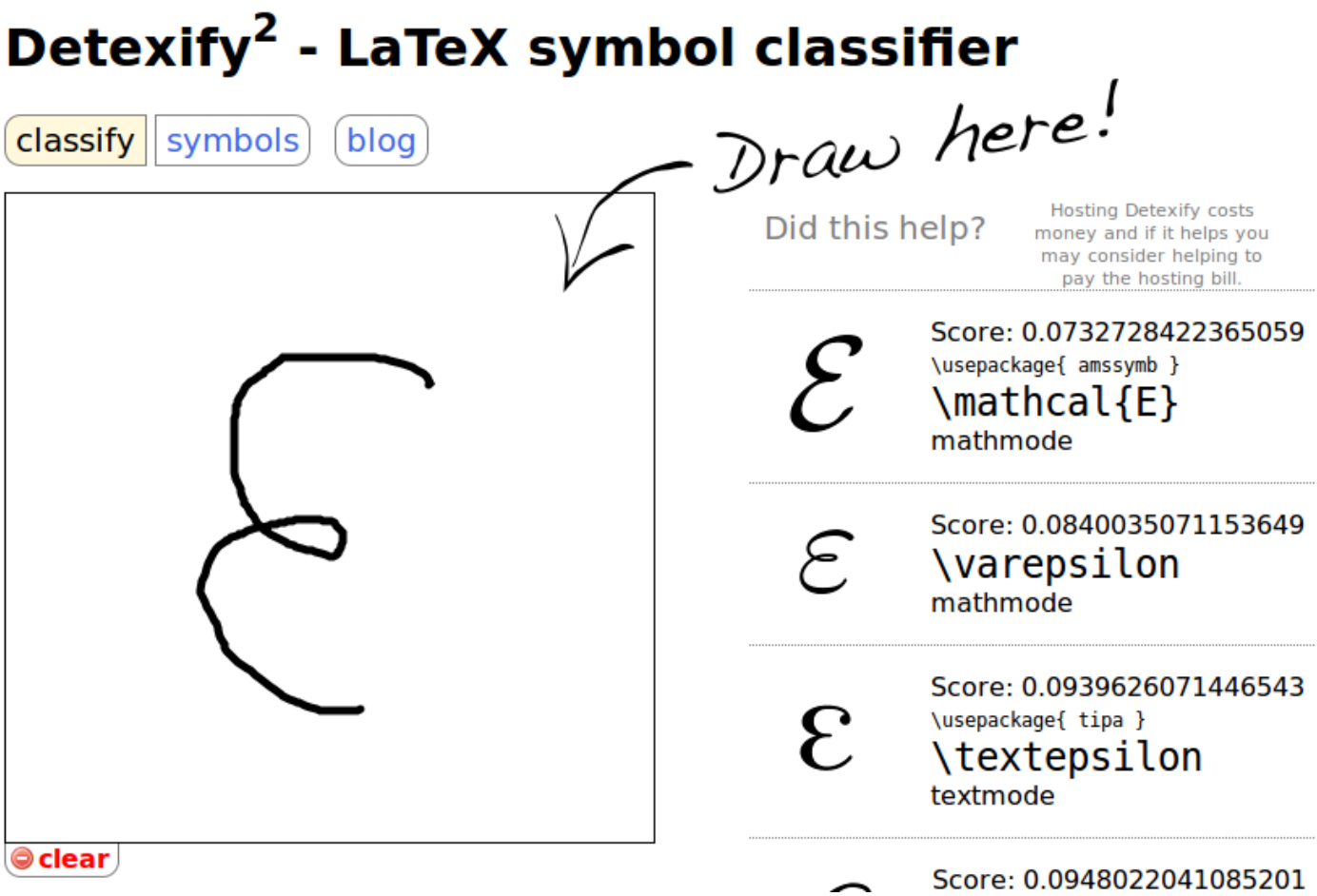
4 Note: `\Big( ... \Big)` produces $\Big(\dots \Big)$ but this bracket size is fixed in all situations unlike `\left( ... \right)` which varies in size with its contents. `\Big` can be useful in various situations. – Nick 2014-12-19 06:34:55Z

Symbols

306

In general, you have to search in long tables about a specific symbol you're looking for, things like Ψ, δ, ζ, $\geq$, $\subseteq$ ... And it turns out that this operation can be frustrating and time consuming, which can cause the buddy to abandon writing the complete $\LaTeX$ sentence in his answer, or in some cases, the complete answer itself.

That's why the tool that I will present you in this post was conceived. Basically, it is a *$\LaTeX$ handwritten symbol recognition*. Example in image:



Here is the website: Detexify² No more frustration.

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answered 2013-10-14 20:15:28Z community wiki user93957

4 How to implement `usepackage` ? I'd like to have `\iddots` from package `mathdots` available. – Gottfried Helms 2016-06-15 11:05:49Z

1 @GottfriedHelms see this question - I think the answer is "you can't do that"... – Floris 2017-06-27 22:40:12Z

@Floris: thanks, that is indeed the informative answer! – Gottfried Helms 2017-06-28 00:35:29Z

1 It recognized my horrible drawing with a finger on my notebook's mousepad! Unfortunately the symbol it recognized (mapsfrom) isn't part of MathJax – Manfred Weis 2019-10-24 05:55:14Z

Continued fractions

97

To make a continued fraction, use `\cfrac`, which works just like `\frac` but typesets the results differently:

$$x = a_0 + \cfrac{1^2}{a_1 + \cfrac{2^2}{a_2 + \cfrac{3^2}{a_3 + \cfrac{4^4}{a_4 + \cdots}}}}$$

Don't use regular `\frac` or `\over`, or it will look awful:

$$x = a_0 + \frac{1^2}{a_1 + \frac{2^2}{a_2 + \frac{3^2}{a_3 + \frac{4^4}{a_4 + \cdots}}}}$$

You can of course use `\frac` for the compact notation:

$$x = a_0 + \frac{1^2}{a_1+}\frac{2^2}{a_2+}\frac{3^2}{a_3+}\frac{4^4}{a_4+}\cdots$$

Continued fractions are too big to put inline. Display them with `$$ ... $$` or use a notation like $[a_0; a_1, a_2, a_3, \ldots]$.

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answered 2012-08-31 19:46:55Z community wiki
MJD

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3 The RHS of the following continued fraction

$$\cfrac{a_1}{b_1 + \cfrac{a_2}{b_2 + \cfrac{a_3}{b_3 + \ddots}}} = \frac{a_1}{b_1} + \frac{a_2}{b_2} + \frac{a_3}{b_3} + \ldots$$

can be typeset with the \genfrac command '{\genfrac{}{}{}{}{a_1}{b_1}} {\genfrac{}{}{opt}{}{}{+}} {\genfrac{}{}{}{}{a_2}{b_2}} {\genfrac{}{}{opt}{}{}{+}} {\genfrac{}{}{}{}{a_3}{b_3}} {\genfrac{}{}{opt}{}{}{+\dots}}' – Américo Tavares 2012-09-17 20:39:24Z

I wonder if something like $\frac{1}{2}+\frac{3}{4}$ would be good enough? It is much simpler.
(`\frac12{\vphantom{1}\atop+}\frac34`) – MJD 2012-09-17 22:30:39Z

1 Yes, it is. I didn't mention it because in *User's Guide for the amsmath Package* it is written the following: "Note. For technical reasons, using the primitive fraction commands \over, \atop, \above in a LATEX document is not recommended (see, e.g., amsmath.faq)." – Américo Tavares 2012-09-17 22:44:09Z

4 Happily, we are not writing LaTeX documents here. – MJD 2012-09-17 22:44:42Z

11 Or write `\underset{j=1}{\overset{\infty}{\LARGE\mathrm K}}\frac{a_j}{b_j}=\cfrac{a_1}{b_1+\cfrac{a_2}{b_2+\cfrac{a_3}{b_3+\ddots}}}` to get

$$\mathop{\LARGE\mathrm K}_{j=1}^{\infty} \frac{a_j}{b_j} = \cfrac{a_1}{b_1 + \cfrac{a_2}{b_2 + \cfrac{a_3}{b_3 + \ddots}}}.$$

– Américo Tavares 2013-01-24 09:15:20Z

10 @AméricoTavares Or use `\mathop` instead of `\overset` and `\underset`: `\mathop{\LARGE\mathrm K}_{i=1}^\infty \frac{a_i}{b_i}`

$$\mathop{\LARGE\mathrm K}_{i=1}^{\infty} \frac{a_i}{b_i}$$

– AlexR 2015-02-21 20:48:22Z

@AlexR It's easier, thanks! – Américo Tavares 2015-05-17 13:24:01Z

@AméricoTavares, Why don't you edit the answer and put this extremely helpful command into there, I think that would be more helpful. – user249332 2016-01-24 15:44:56Z